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Wartime Heating

Its Influence on Reconstruction

IT is high time that the electrical industry considered its position in relation to wartime space-heating problems. Most of us have now modified our earlier idea that it was almost unpatriotic to talk about space heating—an idea arising largely from the secrecy pertaining to many purely war developments. But, as we indicate in our survey of the subject this week, experience has already shown that electric space heating is even more important in its relationship to wartime development than it was in the general scheme of life and work before the war, and we are confident that, properly handled, its increased importance will be maintained—indeed advanced—after the war.

It would be foolish to ignore the fact that many of to-day's exigencies compel the advocacy of measures which the industry was beginning to regard as retrograde before the war. Such problems as urgency of installation, cessation of normal building, shortage of raw materials and air-raid damage do not permit arguments about such considerations as low-temperature *versus* high-temperature heating and radiation *versus* covection. All the same, we have found it extremely interesting to detect the same two main and opposing influences that we were so concerned about in pre-war days still at work.

On the one hand the tendency to adopt some form of electric heating merely because it is convenient as a temporary or supplementary measure is more marked than ever, while, on the other hand, in some quarters more closely concerned with direct war production, greater attention is obviously being paid to the broader idea of the true load builder, namely, system heating, than to the more limited salesman's conception of an installation of heating equipment.

Under present conditions mere convenience of the moment must often necessarily be absolute justification of the installation of a piece of electric heating equipment, but whether it is to the good from the point of view of progress of the industry is another matter.

In considering wartime space-heating problems, we must keep an eye on the development possibilities after the war, particularly during the period of reconstruction, for although it has been made clear during the past two years that the difficulties confronting the advocates of system space heating before the war will be more formidable immediately afterwards, encouragement for renewed and greater efforts will be found in the results of certain wartime developments.

One excellent thing is the explosion of the ideas about the "crude heating field," if only by the fact that scientific control is now being applied to forced-air-circulation heating by the use of the thermostat and by the adoption of loadings, heat-source positions and air speeds as the result of heat-loss calculations.

With general acceptance of the principles of scientific installation, operation and

control for forced-air-circulation heating it will be easier after the war to consider without bias other methods of system electric heating more closely associated with such control principles.

Planning for Peace

WE hear that a meeting representative of all branches of the industry was held last week under the auspices of the Electric Lamp Manufacturers' Association to discuss means of ensuring that the electrical industry takes its proper place in any schemes of post-war reconstruction. As the Press was not invited to the affair we are unable to give details, but we understand that a proposal to set up a co-ordinating committee was adopted. It is intended that this body shall survey the whole problem and also consider collaboration with the Committee already established by the I.E.E. There may be a feeling that the I.E.E. Committee will be mainly concerned with the "professional" side of the industry and that there is a need for something to be done on the more practical or "commercial" side.

Cheapening Distribution

WHILE the most important factor in reducing the cost of distribution is, no doubt, an increase in the number and load factor of kWh sold, a substantial contribution to the same end could be made through the adoption of a smaller number of accepted standards on the lines suggested by Mr. H. J. Allcock in this issue. His arguments are of especial importance at the present time owing to scarcity of materials—a condition that is likely to remain for some time after the war. A further point is that dielectric specifications should not be so rigid as to prevent full advantage being taken of the constantly improving products of cable manufacturers' research laboratories.

Wages and Taxes

THE Government's half-hearted statement on wages policy has been followed by a pronouncement of the Trades Union Congress that wage increases have been inadequate, representing a rise of only 20 per cent. while the cost of living has gone up by 30 per cent. The implication is that the workers must not be allowed to carry the financial burden of the war although it is obvious that the false prosperity thus engendered will make the aftermath all the more unbearable. It is true that Sir Walter Citrine advocated greater voluntary saving and visualised "more stringent needs" if voluntary saving was inadequate, but a resolution was passed demanding the removal of Purchase Tax from "all commodities necessary to maintain the health and well-being of the working classes." One professional trade union has already accepted the principle that war taxation should be excluded from the computation of salary increases, but the example does not appear to commend itself to others. The E.T.U., for instance, would not agree to the proposal when wages in the contracting industry were under discussion recently. Why should it when the principle is not accepted, or enforced, generally?

Installations Section

THURSDAY next will be marked by the opening meeting of the newly formed I.E.E. Installations Section. The choice of Mr. H. T. Young as its first chairman is appropriate for at least two reasons, and there should be a good attendance on the merits of the subject of Mr. R. Grierson's paper, *viz.*, space heating by means of electrically warmed floors. While all members of the Institution have the right of entry to meetings, those wishing to be kept in touch with the activities of the Section (surely a very large proportion of the total, since most electrical engineers are concerned with utilisation in one form or another) may be reminded that they are required to fill in the prescribed form.

Neutral Earthing

SANCTION has been given in recent years to the adoption of protective multiple earthing in several rural areas. An infrequently mentioned advantage of this system is that, under the terms of the Electricity Commissioners' approval, it should reduce the number of accidents caused by the insertion of switches in neutral conductors instead of phase wires of consumers' sub-circuits, since the onus is placed on the undertaking of seeing that this is not done. In the case of ordinary single-earth networks, the undertaking is merely permitted to withhold supplies to installations that are defective in this way, and then, in usual practice, only in emergency.

Space Heating

A Review of Practice under Wartime Conditions

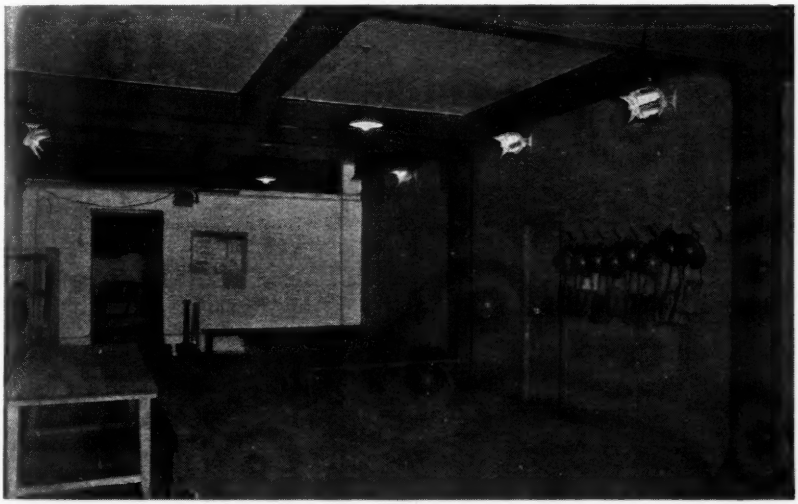
PRESENT-DAY space-heating problems may be considered in three main groups —factory, office and shelter heating—but in discussing the subject in detail under these headings it must be emphasised that we do so purely in the light of to-day's conditions, for we know that many points clash with expert opinion on technical principles. Further, there must necessarily be a great amount of overlapping of the systems recommended for different types of buildings.

We have always held that a satisfactory heating installation can only be designed from a reasonably accurate calculation of the building heat losses, and such calculation is often very difficult in the case of factories because, among other things, the exposure conditions can vary very widely between different sections of one large room and there may be considerable variations due to doors remaining open for long periods. These facts led to a widespread belief that factory heating involves vastly different principles from the heating of other buildings or often, indeed, that principles do not count and that cruder forms of heating are the only solution. No doubt this is, at least partly, why forced-air-circulation factory heating obtained a substantial hold before the war and has made great headway since.

The General Electric Co., Ltd., shows how unit heaters meet the primary requirements summarised by Dr. T. Bedford as the result of his investigations for the Industrial Health Research Board, namely, a suitable degree of warmth should be maintained; the air at head level should not be appreciably warmer than that near the floor; the heads of occupants should not be exposed to excessive radiant-heat; and the air should be moving rather than still.

"Industrial Health in War," published by the Board, gives the following temperatures as desirable in factories: 65 deg. F. for very light work; 60 to 65 deg. F. for light but active work; and 55 to 60 deg. F. for heavy (muscular) work. Any selected temperature can be maintained by correctly matching the air velocity with the loading of unit heaters, and under thermostatic control the heaters effectively steady the temperature at any required level independently of the weather conditions. The use of louvres for correctly directing the flow of air overcomes any tendency to create uncomfortable temperature gradients.

A problem in connection with a large



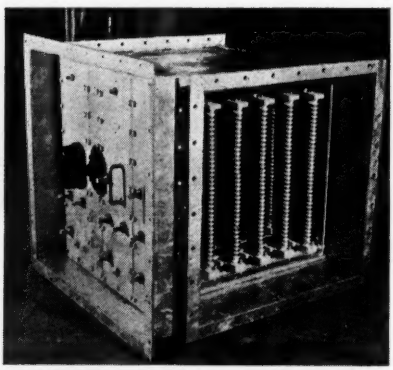
Radiators mounted so as to flood the occupied portion of the floor with radiant heat

sewing-machine room already served with hot-water radiators was to spread additional warmth evenly about the room to heat up the

achieved are effective countering of the output reduction, less liability to mistakes and quicker machine starting during spells of cold weather.

The provision of correct heating results in effective countering of output reduction

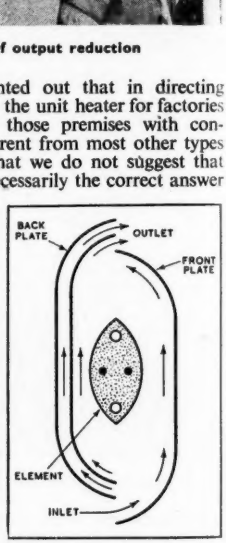
structure of the metal machines and to ensure comfortable conditions for the operators' hands and feet. The room is 11 ft. high with a capacity of 22,000 cu. ft., the walls being of whitewashed brick construction and the ceiling of lath and plaster supported by plaster-covered steel girders. It contains about 50 machines on parallel bench lines. A fan air-



The fitting of direct electric air heaters into existing ventilating systems appears commendable

heater is installed about 10 ft. above the floor level, with the louvres adjusted to propel the air down to the working level. The results

It must be pointed out that in directing special attention to the unit heater for factories we have in mind those premises with conditions totally different from most other types of buildings and that we do not suggest that the fan heater is necessarily the correct answer technically to the particular problem. But we do suggest that under present conditions heating in this way provides a good balance between supply (materials) and production difficulties on the one hand and the purely technical heating difficulties on the other. We must, however, draw attention to the principle of flood heating by both high- and low - temperature radiant equipment, for we have seen highly successful installations using both types in conditions often claimed to be suitable only for crude heating.

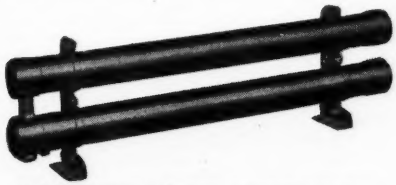


Suitably disposed and shaped guiding plates enhance the value of tubes as a convector

Ferranti, Ltd., have long since developed high-temperature radiation, using reflector

radiators of the bathroom type and designed to be mounted on the walls in such a manner as to flood the occupied portion of the floor space with radiant heat. This method offers a great degree of flexibility as comfortable conditions can be obtained for workers without the necessity for heating the whole of the air in the room.

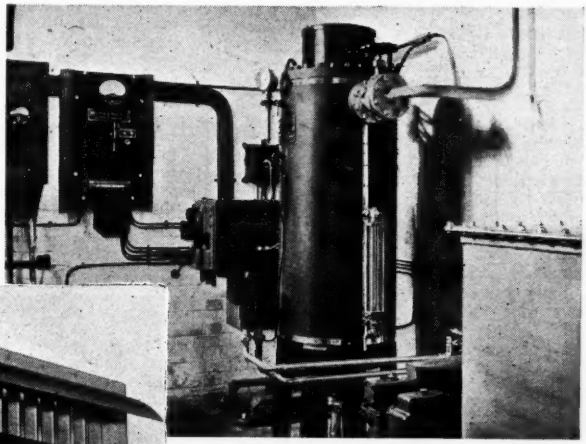
A good example of low-temperature radiant heating is afforded by the panel introduced by Sir Wm. Garworth Jones. The heating wires, moulded in a phenol formaldehyde fabric, are not only used as the heating element, but they serve also to reinforce the panel for mechanical strength. The loading of the equipment is approximately 45 W per sq. ft. and the surface temperature is 35 deg. C.

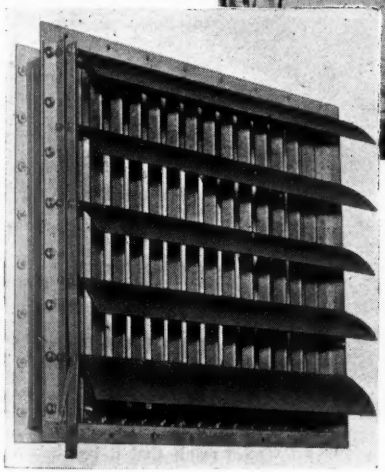


Tubular heaters: Correct calculation and lay-out demand detailed consideration of building construction

There are many factories, however, in which the conditions are similar in many ways to those which are to be found in the commercial type of building, *e.g.*, the large office or block of shops for which the heat losses can be fairly accurately estimated, and in this connection we propose to draw special attention to tubular type heating equipment, once more with an eye on to-day's peculiar conditions. Walsall Conduits say that tubular heating is perhaps the most popular system which has been adopted industrially and, in most cases, is installed exclusively, although in certain instances advantages can be obtained by using convectors with it.

Siemens Electric Lamps & Supplies, Ltd., lay stress on the fact that the correct calculation and lay-out of a large tubular heating installation can only be made by detailed consideration of wall, floor and roof construction, exposure, glass area, etc., adding that any simple formula can only be very approximate. They also strongly advocate thermostatic control for offices on the score of economical and comfortable working conditions. The temperatures of individual offices can be adjusted to suit the occupants' requirements.





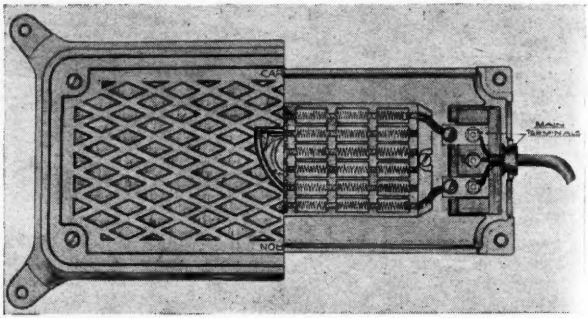
Above: It is usually easy to fit the small electrode boilers near the point where heat is required. Left: Unit heaters are for use with a fan attached directly to the casing

We feel that the progress of tubular heating has been retarded considerably by a widespread belief that the loading of tubes is limited to 60 W per ft., thus denying the installation designer of a very essential requirement—flexibility of loading. The Arora Co. tells us of an interesting tubular-heating installation in the recent extension of a large newspaper building. The tubes are situated under reflectors supported at the required angle by

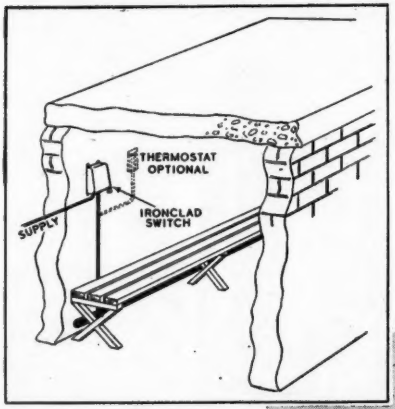
chains, and are in 1,200-W units, each 6 ft. long. In very confined spaces similar tubing is loaded up to 500 W per ft. and operated vertically behind a screen of sheet metal against the wall.

We wish to avoid, for the moment, the radiant *versus* convected-heat controversy, but in the interests of fairness it is necessary to refer to the tubular heater as both a radiator and a convector when discussing the different methods of installation and construction. In the reflector scheme just mentioned the radiation aspect receives special attention. In the "Tuvec" heater of Heatovent Electric, Ltd., particular attention is given to the properties of convection, and the makers say that 25 per cent. of dissipated heat is radiant and 75 per cent. convection. Suitably disposed and shaped guiding plates about the heater create air paths and thus enhance its value as a convector. The standard loading is 150 W per ft.

The oval tube is more efficient than the circular type as a convector, for, as the Wardle Engineering Co., Ltd., points out, over 90 per cent. of the surface of the oval tube is swept by the heat-induced air stream, as compared with 60 per cent. of the surface of the circular tube. For this reason it is possible to have a higher loading for the same surface temperature—80 deg. F. against 60 deg. F.—for similar operating conditions.



This black-heat air-raid shelter heater is a totally enclosed cast-iron equipment



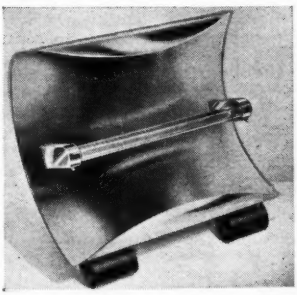
Above: The confined spaces in shelters demand special consideration to safety, and black-heat equipments are appropriate. Right: When facilities for food warming are added a favourable case might be made for the fire

It is pleasing to learn from Bastian & Allen, Ltd., that the electrode boiler business is still progressing in spite of the difficulties relating to the supply of materials. Because of the very small size of the boilers compared with their outputs it is usually quite easy to fit them into some space near the point at which steam or heat is required. Among some interesting instances of these boilers being used to replace fuel-fired boilers which had failed is the case of a Midland mill where there was a steam-heating system originally supplied from the main boilers which had been dismantled. The mill was urgently required as a warehouse and a 350-kW electrode boiler was quickly installed and coupled to the heating system.

Under present conditions the fitting of direct electric air heaters into existing ventilation systems appears commendable. In many cases existing buildings put up for some other purpose have been converted to wartime offices, with the result that it has become

necessary to provide mechanical ventilation as well as heating. With the unit system of construction B. & A. heaters can be produced in any size. The usual requirements seem to be between 4 and 150 kW. Bray bank-type heaters designed to fit into ductwork are available with loadings as high as 486 kW. They are built up in rows of elements, each row carrying its own busbars and being separately withdrawable. The Bray unit heaters are for use with a fan attached directly to the casing.

A very special problem to-day, particularly in regard to offices, is the speedy establishment in "new" premises, often temporary, after air-raid damage. In this respect portable equipment is of outstanding importance, especially the ordinary radiant fire. The portable meter fires, introduced for hotel use a few years ago, can be the means of a quick heating supply without having to wait for alterations to wiring and metering, and with a little goodwill it is possible in this way to avoid special arrangements and disputes about consumption. An example, the "Carrometer" by Carron Company, is a double-trough horizontal reflection fire, loaded at 2 kW, which weighs only 23 lb. and measures only 22 in. by 14¾ in. by 7¼ in., so that it takes up little space in storage or in operation—a most important thing at the moment.



The specially shaped reflector permits a view of the glowing elements from any position

Shelter Problems

In most structures whose primary function is to afford protection to the occupants—public and private shelters, A.R.P. posts, control centres, and so on—the protection is obtained at the expense of normal ventilation and the result is dampness. Heat is introduced as the remedy, but disappointment often follows, simply because heat without ventilation will not cure dampness, and in stressing this we consider Electroway Heaters, Ltd., are rendering a really useful service to the community. But heat can be applied to create artificial or enforced ventilation and so solve both temperature and dampness problems, and a little experimenting with convection heating has afforded us an appreciation of the real significance of this fact. The British Trane Co., Ltd., is experiencing an increasing demand for both electric "Univectairs" and "Vectairs", depending in each case on the size of the shelter and the degree of air movement required.

The warm air circulator by Belling & Co., Ltd., is a wall-fixing unit which operates on the same principle as the "Champion" heater. Air is drawn in at the bottom and, passing up through the cone-shaped vertical heating element, is warmed and flows out at the top. A secondary flow of air behind the heater prevents loss of heat to the wall. Heatovent report that for shelters designed for more than 50 people they have installed fan unit heaters with success.

The confined spaces in shelters demand special consideration to safety, and so most black-heat operating equipments have a claim. For instance, the familiar perforated metal-cased radiators of Geo. Bray & Co., Ltd., are now listed as a range of shelter heaters. The 500-W black-heat Carron air-raid shelter heater is a small totally enclosed cast-iron equipment with stub legs for floor or wall mounting. Tubular heating also has a place on this score.

The normal radiant fire can hardly be regarded as ideal shelter equipment if we measure safety in pre-war terms, but it seems hardly reasonable to do this under existing conditions, particularly in the light of the greater risks associated with shelters. When, therefore, the "sense of comfort" given by a glowing fire, so valuable under shelter conditions, is stressed, it seems reasonable to "shut the eye" to what would normally be bad practice. The wide-angle radiant fire by H.M.V. Household Appliances offers particular advantages from this comfort aspect because the specially shaped reflector permits a view of the glowing elements from any position.

Further, when facilities for food warming are added quite a favourable case might be made for the fire. Such facilities are provided by, for instance, the Belling "Utility" and the "Creda Warden" fires, both of which have an upward heat projecting fire-bar under a grill, a suitable arrangement for both boiling and toasting.

Australian Power Station Reconstruction

SYDNEY (N.S.W.) County Council has approved of the reconstruction of the Pyrmont power station to provide additional generating capacity required after the year 1946, reports the *Electrical Engineer and Merchandiser*. It will have 150,000-200,000 kW of generating plant estimated to cost between £3,600,000 and £4,700,000. In September last year the Council approved in principle of the reconstruction as recommended by the general manager, Mr. R. Vine Hall, and decided to ask the advice of the Electricity Advisory Committee regarding power station sites. The Committee has now decided that the proper location for the next station to be constructed in the Sydney metropolitan area would be that of the existing Pyrmont station.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Chief Engineers' Salaries

I NOTE with astonishment that Mr. Sumner claims to have had access to the minutes of a private meeting at Leeds.

It is evident that his statement is incorrect, with regard to the figures recorded in the minutes, as, instead of the percentage of those eligible for membership of the A.M.E.E. who are actual members being fixed at 56 per cent. (as stated by him), the minutes give it as 88½ per cent. as quoted in the letters of Mr. Parker and myself.

Mr. Sumner's letters seem to be designed to do all the injury they can to the attempts to improve the position of chief engineers generally, and after reading them I do not wonder that he is outside the A.M.E.E.

Manchester. W. WALKER.

Commercial Professional Staffs' Salaries

ONE of the issues raised by your correspondent, Mr. P. H. Flatt, was the lack of "any one body to which appeal can be made for adequate remuneration" for the non-technical professional staffs, and he suggests the possibility of the formation of an Association "to approach employers regarding the grading of existing personnel," etc.

I wonder if he is aware of the E.S.C.A. (Electricity Supply Commercial Association) which was founded at the end of the last war for that express purpose and which foundered because local authorities were loath to recognise any differentiation between the salaries of the various departmental staffs.

As a member of the National Executive Council of the N.A.L.G.O., I can assure Mr. Flatt that that body will take up the case of commercial assistants and kindred staff on request. I would also point out that most "Nalgo" local executive committees include representatives from the Electricity Departments, and if any commercial assistants or the like have a grievance, it would be taken up immediately by the executive committee or through the appropriate divisional officer.

THOS. NOLAN,
Leeds. *Chief Clerk and Accountant,*
Corporation Electricity Department.

THE letter from Mr. A. E. Morgan is all the more astounding because he claims to voice a representative opinion. I would suggest that he makes himself familiar with the economics and history of the industry, and I think he will find the answer is "units and more units" and salaries must depend upon the commercial value of the individuals employed. Mr. Morgan will find that ratepayers or shareholders care not a fig for technicalities, it is a credit balance they insist upon.

Does the inventor or designer get satisfaction from the fact that his "pet" is of no commercial value? The accountants decide the latter, and they need not be technical or commercial; the management has the advice of both departments, and good management is "technically commercial."

I would like to ask whether the E.P.E.A., which I presume has trade union objects and principles, is representative of the electricity supply industry as a whole, or the majority of any one section? Is the management committee of the E.P.E.A. likewise a representative body? What voting power has the E.P.E.A. on the N.J.B. and does this voting power represent equally each section of the electricity supply industry?

London, N.W.6. W.D.-W., B.Sc.(Eng.).
General Manager.

MR. FLATT'S second letter on this subject represents an improved appreciation of the position of engineers in the electricity supply industry and his final conclusion will meet with general agreement. He concludes "a commercially alive administrator who is also an engineer makes an ideal general manager." Presumably he means a qualified engineer and as this demands early practical training as well as several years of technical study and experience, it is assumed his ideal general manager is primarily an engineer who also possesses the necessary administrative ability and commercial knowledge. It is to be noted that most universities now include industrial administration, economics and other commercial subjects in their engineering courses and, whilst administrative ability is largely a matter of personal characteristics, qualified engineers will possess the knowledge of broad commercial principles which is considered necessary.

The need for professional commercial men in the industry is now recognised and the specialised nature of their work, together with the necessity for their proper recognition and adequate remuneration, has been previously admitted. The main point which Mr. Flatt and other commercial men fail to realise is that this does not automatically make them qualified to control the direction of the electricity supply industry. In insurance, banking and certain other professions yes, the commercial man is concerned with the

business from start to finish and he naturally assumes control; there are other functions such as inspecting in insurance but these are subsidiary.

In the electricity supply industry, however, it is the commercial man who is sectionalised. He presents the final financial results it is true, and often for this reason it is imagined that he is the person in control, or best suited to control the industry, but he does not *produce* these results, he only analyses the results obtained and makes them up into a recognised form. He is not equipped to direct the production, distribution or sale of electrical energy, all of which require engineering training to a greater or less degree; his function is therefore limited to one section or department only, and obviously this is a limitation which debars him from exercising general direction in a managerial capacity over this particular industry.

No doubt it will take time for this to be fully realised, but in those cases where purely commercial men have been appointed to the office of management those responsible should consider carefully whether it is to be expected that satisfactory and economic results can be obtained in view of the obvious limitations to the exercising of complete control.

*London, S.W.*14. A. E. MORGAN.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT an informal luncheon held at the Holborn Restaurant on August 27th, the Council of the Electrical Wholesalers' Federation entertained **Mr. A. G. Beaver,** managing director of the Sun Electrical Co., Ltd., on the occasion of his being again elected president of the Federation. He last held this office in 1922.

Mr. Beaver was one of the small group of electrical wholesalers who got together in the early months of 1914, as a result of which the Electrical Wholesalers' Federation was inaugurated. In the early days of the Federation's activities he served for some seven years as honorary secretary, and since its inception he has devoted a great deal of time and enthusiasm to the electrical wholesaler's cause.

Mr. A. E. Cunningham is to present his address as chairman at a meeting of the I.E.E. North Midland Students' Section on October 25th at the Hotel Metropole, Leeds. His subject is "Electric Motors." The section is paying a visit to the new X-ray Department of Leeds Infirmary on September 20th; Mr. J. C. W. Wilkinson, assistant secretary, is in charge of the arrangements.

Mr. W. A. Walker, Kettering borough electrical engineer, has been ill, but we are pleased to hear that he is now progressing satisfactorily.

Mr. L. Owen, A.M.I.E.E., retired from Central London Electricity Ltd., on September 2nd, having completed forty years' service. He joined the Charing Cross & Strand Electricity Supply Corporation in 1901 as a junior engineer. He served over four years in the last war. In 1936 he was appointed mains superintendent of the old Charing Cross Electricity Supply Co. and continued in this position with Central London Electricity, Ltd.

Mr. J. L. Ogden, who recently retired from the position of borough electrical engineer of Oldham, has received presentations from the Electricity Committee, including a folding trolley table from Mr. F. Kenyon, chairman of the Committee, and an oak fitted wardrobe from Mr. G. E. Emmott, on behalf of the employees.

Mr. A. J. Hastings, who has retired from the position of deputy borough electrical engineer of Great Yarmouth after forty-three years' service with the Corporation Electricity Department, commenced his career with Crompton & Co., and went to Yarmouth in 1898. Before being appointed deputy electrical engineer four years ago he was in charge of the mains department. At a farewell gathering on August 30th, Mr. P. Rycroft, borough electrical engineer and manager, presented him with a 6-valve wireless set on behalf of the staff and employees.

Mr. J. W. Price, chief electrical engineer at the Ocean Colliery, Treharris, since 1921, retired on August 30th.

Mr. D. Melton, who has been appointed assistant shift engineer with the West Ham Corporation Electricity Department, was formerly with the Salford Corporation Electricity Department.

Due to the continual increase in the number of employees of the Brush Electrical Engineering Co., Ltd., and its associated companies, the labour and welfare department of the group has been reorganised and its activities extended. **Mr. D. S. A. E. Jessop** has been appointed chief labour officer to take charge of the department. Mr. Jessop formerly held responsible positions in the labour departments of two of the largest combines in this country.

Mr. W. A. Tookey has been appointed a deputy-director, Royal Engineer Equipment, to the Ministry of Supply, for the duties of Engine Planning Officer.

The wedding took place at Rugby recently of **Miss Margaret Ann Sporborg,** daughter of Mr. H. N. Sporborg, M.I.E.E., chief engineer and a director of the British Thomson-Houston Co., Ltd., and Captain Keith Lomas, Royal Artillery.

Mr. R. Farrall, A.M.I.E.E., test superintendent to the London Passenger Transport Board, was married recently at Hounslow to Miss Mary Joan Penney.

Mr. M. P. Finlay, secretary of the Electrical Contractors' Association of Scotland, was married in St. Oran's (Gaelic) Church, Edinburgh, on August 30th, to Miss Florence Elizabeth Maclean, M.A.

The wedding took place recently at All Saints' Church, Banstead, of **Mr. I. F. Young** and **Miss Mary Elizabeth Watt.** The bridegroom is local

manager at St. Ives, Cornwall, for Edmundsons Electricity Corporation, Ltd., and the bride was in the employ of the London and Home Counties Joint Electricity Authority.

Mr. J. G. Leng, power station superintendent, Harrogate Corporation Electricity Department, will shortly be relinquishing his post, having reached the age limit. Mr. Leng has been with the Harrogate undertaking for over forty years. The vacancy will be filled by **Mr. V. Lever, B.Sc. (Hons.), A.M.I.E.E.,** who is at present a day charge engineer with Oldham Corporation.

Mr. L. Raven, B.Sc., A.M.I.E.E., who is at present sales engineer with Cardiff Corporation Electricity Department, has been appointed consumers' engineer with Harrogate Corporation Electricity Department. Prior to going to Cardiff, Mr. Raven was on the staff of Manchester Corporation undertaking, and at Wallasey.

At last week's meeting of the Trades Union Congress, **Mr. E. W. Bussey,** president of the Electrical Trades Union, was elected to the General Council.

According to the *Journal* of the Engineering Institute of Canada, **Mr. Augustin Frigon,** M.E.I.C., assistant general manager of the Canadian Broadcasting Corporation, has recently been entrusted with new responsibilities by the Board of Governors of the Canadian Broadcasting Corporation. Hereafter, he will be in charge of the financial administration of the Commercial and of the Engineering Divisions and will supervise generally the programmes of the French network.

Obituary

Mr. T. Harding Churton.—We regret to learn of the death of Mr. Thomas Harding Churton, which has occurred at his home in Leeds at the age of seventy-five. Mr. Churton, who commenced making electrical machinery in 1897, founded the company of T. Harding Churton & Co., Ltd., electrical engineers, in 1910, and resigned from the position of governing director upon the amalgamation of that company with Newtons of Taunton Ltd., in 1931. A few years ago he became chairman of the Middleton Estate and Colliery Co. (Ltd.), after serving for several years as vice-chairman. Mr. Churton was a member of the I.E.E. and was a former chairman of the North Midlands Centre.

Mr. E. Royston.—The death occurred at Giffnock, Glasgow, on August 28th, of Mr. Eric Royston, M.P., of Troup Curtis & Co., Ltd., electrical engineers, Glasgow.

Mr. F. E. Spencer.—We regret to report that Mr. F. E. Spencer, borough electrical engineer of Birkenhead, died on September 5th at the age of 64, after two months' illness and a recent operation. He began his career with the Midland Railway Co. at Nottingham and after serving in power stations at Leeds and St. Pancras, went to Birkenhead in 1889 as engineer in charge of the tramways power station.

He occupied progressive positions as station superintendent and chief assistant and deputy electrical engineer. He served under three borough electrical engineers and succeeded Mr. Shallcross, as chief of the department in 1926 In 1936, he served as chairman of the Mersey and North Wales Centre of the I.E.E.

Sir Alexander Swan.—By the death of Sir Alexander B. Swan, D.L., LL.D., chairman of the Craigpark Electric Cable Co., and chairman or director of a number of industrial undertakings, on September 2nd, Glasgow has lost one of its leading business men and a former Lord Provost. Sir Alexander, who had been seriously ill for some time, was 72 years of age, and was appointed Lord Provist at a time when Glasgow was suffering severely from the effects of the industrial depression during the past decade. He was untiring in his efforts to proclaim the advantages of Glasgow as an industrial centre and explored every means of relieving the heavy unemployment in the city. Tribute to Sir Alexander's services to the city was paid when he received the honorary degree of LL.D., from Glasgow University in 1935. In the following year he was appointed a Deputy Lieutenant for the County of the City of Glasgow.

Capt. J. H. M. Clark, whose death at Troon is announced, was a director of the Clyde Valley Electrical Power Co. and the Strathclyde Electricity Supply Co.

Will.—Mr. F. F. Elliott, borough electrical engineer of Woolwich, left £5,670 with net personalty £4,528.

Canadian Utilities and the War

DEFINITE steps are being taken by the Canadian public utilities to meet the growing demand for technical personnel and trained mechanics for industrial establishments engaged in wartime production. The *Electrical News and Engineering* (Toronto), reports the setting-up of a Public Utilities Wartime Workshop Board to centralise facilities for achieving a threefold aim: (1) The training of military personnel; (2) the manufacture of " bits and pieces " for munitions-producing factories; and (3) the training of civilian personnel. The organisation has already started to function and some of the companies have secured enough work to keep their workshops busy until the end of the year.

The training of military personnel is to be done in collaboration with the military authorities. The Canadian Ordnance Corps requires 15,000 skilled men before the end of the year and skilled instructors, especially those capable of giving advanced instruction, are at a premium.

In their workshops the utilities undertake the production of small parts, particularly those which tend to create " bottle-necks " in the munitions industry. Contracts are taken on either at fixed prices or on a " cost plus " basis, according to the character of the work. The Board operates as a non-profit-making organisation, but its expenses are met by a levy, at present 5 per cent., of the invoice value of the work.

The training of civilian personnel is linked up with the workshop programme. As this programme gets under way and the workshops are put on a 20 to 24-hour schedule it will be necessary to increase the staff. It is, therefore, suggested that the assistant foreman or other responsible individual in the various shops shall be made foreman of an extra shift and that apprentices, older men and men with previous mechanical training shall be taken on and trained in shop work.

At a recent meeting of the Board Mr. J. K. Wilson, of the Shawinigan Water and Power Co., was appointed chairman and Mr. A. W. Manby, Hydro-Electric Power Commission of Ontario, vice-chairman.

Rationalising Cables

By H. J. Allcock, M.Sc., M.I.E.E., M.I.Mech.E.

Distribution could be cheapened by a reduction in the number of types of cables, but standardisation measures should not prevent advantage being taken of improvements in materials and processes

DIMENSIONS of electric power cables used in this country have been standardised by the British Standards Institution for a considerable number of years, modifications having been introduced, of course, from time to time in order to take advantage of improvements in technique and new and more efficient methods of manufacture. The case for standardisation is well recognised, and it normally results in the cheapening of a product and a general improvement in its technical performance. It is not always realised, however, that if the number of varieties in a set of standards is very large, these advantages cannot always be obtained, and in such cases it is only by a rationalisation of the standards and a reduction in the number of varieties that all the advantages of standardisation can be achieved.

A perusal of B.S.S. 480–1933, which covers paper-insulated metal-sheathed power cables, will show that the number of types and sizes of cable is excessive, and that a reduction is imperative, more especially in wartime, if economic manufacture is to be achieved. Recently, certain measures of rationalisation have been proposed which would effect some reduction in the number of types and sizes and, although these suggestions would not necessarily result in a complete rationalisation, they should undoubtedly be accepted, since even a partial rationalisation is better than none at all.

The suggestions are five in number, namely: (1) The use of shaped conductors only (except in the case of the smallest sizes of conductor) for twin and multicore cables. (2) The elimination of certain conductor sizes which are not very much in demand. (3) The elimination of unearthed type cables. (4) The standardisation of a core distinguishing scheme by numbers instead of the use of different coloured papers, which, it is hoped, could be more universal. (5) The elimination of the 460-V type of cable.

It is realised that this last suggestion may not be capable of complete achievement, and that an economic point can be made for the use of 460-V cables in scattered areas of a low density of population, but, if this is so and the cables are necessary, then their use should be restricted, say, to three or four sizes. On the larger sizes of conductor the maximum saving which could be effected by the use of 460-V cable instead of 1,000-V is so small that it is hardly worth while making and, indeed, may be entirely negatived by the economies which might result from a rationalisation of the standards.

This, however, is not all that can be done to simplify matters. In certain cases, standardisation within a manufacturer's own organisation is impossible, because a number of definite rigid specifications for materials and processes of manufacture have been laid down by his customers. Not only may this result in certain plant having to be duplicated and output being slowed down to a large extent, but it may very effectively prevent further developments being carried out in the improvement of both materials and processes.

Mr. Allcock is process manager to Callender's Cable & Construction Co., Ltd., and was chairman of the Transmission Section of the I.E.E. for the 1940-41 session

In none of the cable specifications issued by the British Standards Institution are any requirements laid down regarding the physical and chemical characteristics of the dielectric to be employed; nor do these specifications give details of the electrical qualities which the dielectric must possess, with the exception of a short-time high-voltage test (intended to act as a routine commercial test on the cables to ensure that the quality is above a desirable minimum) and, in certain cases, insulation resistance. Referring again to B.S.S. 480–1933 as a typical example of a cable specification, this point is stressed by a note on the title page reading:—"This specification does not deal with the composition, quality or durability of the insulating material used as the dielectric."

The electrical and mechanical properties of a dielectric, which in the case of a cable is generally of a composite nature, depend not only on the individual properties of the raw materials but also upon the processes involved in the manufacture of the cable and the control which is exercised thereon. It is, of course, impossible to specify in detail the processes of manufacture, which may vary considerably from one manufacturer to another. Again, it is not always possible, by a mere consideration of the details of two processes, to determine

which is the better; only by carrying out a great deal of experimental and research work could their relative merits be established.

To all this must be added the fact that advances in technique are constantly being made. Continued improvement is to be anticipated in both materials and processes; and, since the majority of improvements are the results of research carried out by the manufacturer himself, he, as a rule, is in the best position to judge what materials should be used and to determine the method of processing which should be adopted in any particular case. If a certain class of material is at present the most suitable for a given purpose, this does not mean that it will always remain so; some advance in technique may radically alter the whole position in a very short time.

Undesirability of Specifying Materials

Therefore, if in his inquiry the customer ties the manufacturer down to a certain definitely specified material, he is not necessarily obtaining the one most suitable for his purpose; and in any case he is not taking full advantage of new developments in materials and technique. Indeed, in many instances he is actually discouraging the manufacturer from pursuing the researches which make such advances possible. Again, given the choice of two alternative materials, each offering the same economic and technical advantages, it is much better to leave this choice to the individual manufacturer, since this enables him to achieve a degree of rationalisation in his own factory.

In certain cases performance tests on raw materials have been specified, sometimes on the assumption that the same performance would be maintained on the finished cable. This result may not always be achieved, since the processing to which the material is subjected during manufacture may change its state to such an extent that its properties in the completed cable are entirely different from those it possessed originally. It is also possible that the combination of two or more materials will result in the requisite characteristics being obtained in the finished cable, although these characteristics may be entirely different from those of the individual raw materials.

The remedy for this state of affairs is relatively simple, resulting in a freedom of choice of materials and processes which would materially assist the manufacturer. While the purchaser should call in general terms for a dielectric of a certain type, specific details of the materials and methods of processing should be left entirely to the manufacturer. The purchaser's interests could be amply safeguarded by testing the finished cable for compliance with the requirements of performance tests, the details of which would be based on the combined experience of purchaser and manufacturer.

The performance tests may be divided into two groups, namely type tests, which are carried out on typical lengths or samples therefrom, and inspection tests, which are carried out on every length. The type tests, which are carried out on sample lengths selected at random from the main production lengths, may, in some cases, be prolonged to destruction. They may consist of long-time breakdown tests, loading-cycle tests on a length of cable laid under operating conditions, etc. They do, on the whole, determine the suitability of the design of the cable and also the materials and methods of construction employed, having in mind the service for which the cable is intended.

It is, of course, only for cables of the highest voltages that these tests are required, since the factors of safety which are provided in the lower-voltage cables are such as to ensure that a well manufactured cable of the standard design will adequately perform the duties required of it. In these cases it is only necessary to carry out inspection tests at the factory.

Inspection tests are carried out on every length of cable manufactured and since they are designed solely for the purpose of establishing uniformity they are not carried to destruction. In consequence, they are made sufficiently severe to ensure that the desirable minima of characteristics are present, but not so severe that they in any way reduce the serviceable life of the cable. Normally, the tests consist of a short-time breakdown voltage test and measurements of capacitance, insulation resistance and conductor resistance.

Ensuring Satisfactory Performance

Performance tests are the purchaser's real guarantee that the finished cable is suitable for its purpose. It will be found in practice that this method of specifying by performance provides the proper basis for ensuring uniformity of quality and a satisfactory standard of performance, without obliging the manufacturer to adopt a multiplicity of materials and processes which would certainly affect his own internal standardisation.

Although the suggestions outlined are applicable to both peace and wartime, the limitations of supply of raw materials imposed by wartime conditions provide another cogent argument in their favour. Many materials which are normally readily available become scarce if not entirely unobtainable during wartime, and consequently many changes and adjustments are necessary in both materials and processing.

In order, therefore, that the performance of the cable shall be maintained at as high a standard as possible in spite of all these enforced changes, it is essential that the manufacturer, whose accumulated knowledge and experience best qualify him to decide on the procedure to adopt, should be allowed a certain freedom of choice in these present times.

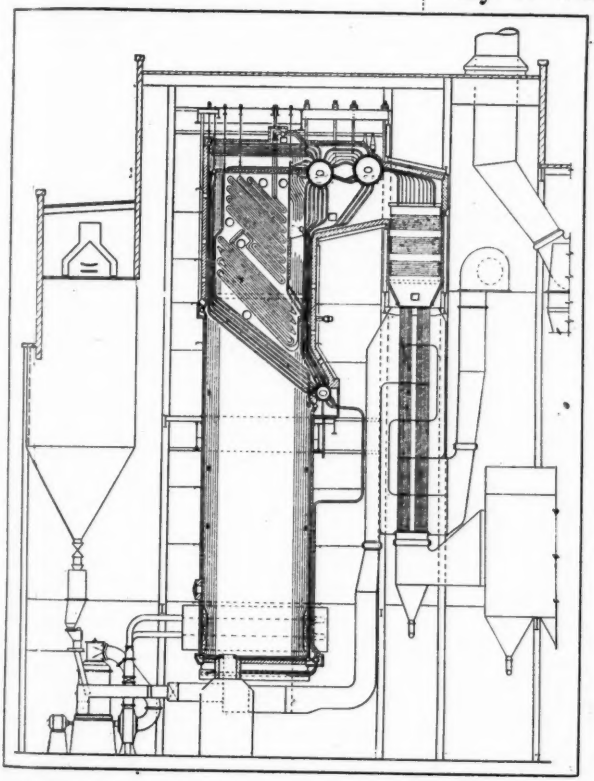
Pulverised-Fuel Firing

Operating Experiences in the United States

Methods of sampling fuel, and points in furnace design, are the subject of a recent Edison Electric Institute report.

By V. Walker, A.M.I.E.E.

SOME information on methods of sampling both raw and pulverised coal is given in a recent report of the Prime Movers Committee of the Edison Electric Institute. A common method is to insert a 1 to 1¼ in. brass sampling pipe into the exhauster discharge duct, one end of the pipe being cut on a 45-deg. angle and the other attached to a vacuum cleaner bag. The open side of the angle end is held facing the flow in a number of positions across the duct and the mixture of fuel and air is blown into the bag by the pressure in the duct, the fuel being held while the air passes through the bag. In some instances an ejector is employed to draw the sample of pulverised fuel from the piping and discharge it into a collecting bag. Comparison between the velocity in the sampling tube and in the duct is made by means of a draught gauge.



Section of a 435,000 lb. per hour boiler with continuous drip type slag-bottom furnace installed in an American station

Another method is to insert a sampling tube about 15 in. long and 1 in. diameter into the coal stream. The coal inlet on the tube, which is covered by a retractable sleeve, is then uncovered and when filled with coal the tube is closed and withdrawn.

An automatic sampler is being employed in several stations, the principle of which is to obtain samples of raw coal at predetermined short intervals continuously during the operation of the coal handling equipment. In the the coal stream, falling from a belt conveyor or travelling in a chute, is inserted a hollow cast - iron sampling spoon with a longitudinal slot of adjustable width, which, in its normal position, is open on the underside opposite the flow of the coal. At predetermined intervals the opening is reversed to expose the slot to the falling coal, which on

entering the slot travels through the hollow spoon to a sampler and crusher.

After the coal has been crushed to the desired size by the first or primary crusher a sample is taken and the coal passes through a secondary crusher. For moisture determination a sample is taken from the primary crusher before the moisture content is reduced by pulverisation. The sampler travels backwards and forwards across the coal stream taking samples intermittently, each sample joining the rest to form a complete cross-section of the stream in one direction of travel.

Control of coal fineness to the burners is of the utmost importance since it results in proper combustion conditions and makes possible low combustible losses. Generally fineness is regulated either by adjustment of mill classifiers, regulating both the velocity of the air through the mill and the coal feed to the mill, or in the case of the Hardinge mill by the size of the balls in the mill casing. As mill parts wear pulverisation becomes worse, adding to the problem of keeping heating surfaces free of slag. With coal rich in iron pyrites the service life of mill parts is materially reduced.

Life of Burners

Burner life is dependent on a number of factors such as the abrasive action of the coal, and on coking and overheating, which depends on how well the burners can be cooled by the admission of secondary air when out of service. To prevent fires from starting in the burner, holes have been drilled at suitable points in the casing and provided with plugs. The plugs are removed when the burners shut down and compressed air is used to blow out any accumulated coal dust. The proximity of the burner tips to the point of ignition also affects the functional life. The design of the burner throat to secure proper secondary air velocity is also an important factor in providing adequate cooling of burner parts and in controlling ignition. A recent improvement is the use of heat-resistant alloys for all exposed parts such as burner boxes and burner tips.

The most common present design of slag-bottom furnace comprises a top-supported boiler unit with the side walls carrying the furnace-floor structure. The floor and walls expand as a unit without relative movement, making possible a tight seal in the furnace sides. The floors are invariably water cooled, either by full stud-tube construction covered with plastic chrome, or water-cooled iron blocks with fins at the edges packed with chrome. Plain and fin tubes backed by chrome ore are also employed extensively.

To avoid overheating of the floor bottom complete drainage of the slag from the floor is prevented by providing a curbing at the tap hole in the centre tap design or along the slag-drip edge on slag-drip furnaces. The curbs are water cooled and consist of one or more coils of one-inch tubing in which water of high velocity is maintained to avoid fouling. Many troubles with molten slag bottoms come from the burning of coals rich in pyrites which tend to form pools of iron sulphide in the slag bed. Continuous tapping is often preferred as small drops of iron sulphide are removed before they coalesce into pools. Nevertheless, gradual accumulation of iron sulphide and iron reduced from it may require periodical mechanical removal, the amount depending on the rate of firing, which is reduced by a high degree of pulverisation and by keeping the slag volume in the furnace low.

Excessive Slag Formation

In a number of recent high-pressure high-temperature boilers gas temperatures in different parts have been higher than expected. This has often been due to the character of the ash which results in excessive slag formation. The ash softening temperature, as ascertained by laboratory analysis, may in some cases be as much as 400 deg. F. below that at which the ash becomes molten enough to run. The consequence is that the slag may become sticky at say 2,300 deg. and will not run from the furnace walls until the temperature is increased to 2,750 deg. This results in a thick accumulation of slag of high insulating value, which reduces the heat transfer rates.

In units provided with two-stage furnaces this condition results in excessive temperature and erosion and warping of the bare furnace blocks in the secondary furnace. The block construction in the secondary furnace has therefore been replaced in some cases with 100 per cent. bare tubes, which has reduced the gas temperature entering the boiler tubes and also the slagging on the convection surfaces. In the primary furnace the slag builds up on the walls until a point is reached at which the surface of the coating remains molten, representing a temperature approximately of the ash liquid temperature. The heat-absorption receiving temperature of the walls therefore corresponds closely with the liquid temperature of the ash. When boilers are first put into service or are clean the gas temperatures may be uniformly low, resulting in reduced superheat, until the furnace has received a coating of slag.

In general, the accepted practice is to design the pulveriser mills so that the combined capacity is from 20 to 30 per cent. in excess of that required to provide the maximum steam output of the boiler unit. If two mills per boiler are installed each mill is capable of providing some 60 per cent. of the maximum boiler output under a suitable range of operation. Air ducts, burner piping, and burners must also be provided with excess capacity which affects operation at low ratings.

The choice between vertical and horizontal burners is determined by the class of fuel to be used rather than by space limitations.

Vertical firing with a U-shaped flame is advantageous with fuels of low volatility such as anthracite and coke breeze, the up-flowing leg of the flame remaining comparatively opaque and strongly radiant up to burner level. The shielding of the ignition zone and increased direct radiation to it by the back leg of the U accelerates ignition.

Vertical firing also tends to increase ash precipitation in the furnace. For vertical firing with dry-bottom furnaces the distance from the burners to the floor or top of the ash hopper should not be less than 22 ft. and the furnace height, measured along the back leg of the U-shaped flame, should be at least 50 per cent. greater. The furnace depth, front to rear wall, should not be less than 18 ft. and generally greater, depending on the amount of fuel fired per burner. The width depends mainly on the capacity and draught loss.

With horizontal burners the distance between the burner wall and wall opposite should be great enough to prevent flame impingement against the rear wall, a minimum distance of between 19 and 20 feet being favoured. The height of the furnace is determined by the temperature at which the ash fuses, and the heat liberation selected.

The best furnace performance is obtained when the number of burners in operation results in good ignition and at loads that do not result in flames of too great length. The use of too many burners at extremely low loads results in poor ignition, furnace pulsations and, if carried too far, in higher carbon loss as well as high excess air. Too few burners operated at very high loads results in smoke and accompanying high carbon loss and the flames become too long, causing impingement on furnace walls or boiler tubes.

In order to prevent coal settling in the pipes between the mills and the burner, sufficient curvature must be provided on the horizontal bends. If the burner piping is oversized the problem of coal settling may give concern because of the fire hazard. In many cases when boilers are taken out of service all pulverised fuel from the storage bins is removed by the feeder. The sides of the bins are cleaned with hand tools, thereby eliminating possibility of fire in the bin.

The 435,000 lb. per hour three-drum bent-tube boiler illustrated (p. 231) is designed for steam conditions of 1,475 lb. per sq. in. and 935 deg. F. and is installed in the Northwest Station of the Commonwealth Edison Co. The slag-bottom furnace is of the continuous drip type fired by eight tangential burners supplied from two pulverisers. The furnace is designed for a conservative heat liberation of 24,800 BThU per cu. ft. per hour. Economiser and air preheater are of the tubular type.

Paint Drying by Infra-Red Radiation

THE application of infra-red radiation to paint drying and baking has been found to result in a number of advantages in America, where several installations have recently been completed.

One of the largest is at the works of the Thermador Electrical Manufacturing Co., Los Angeles. The drying tunnel is 22 ft. long and contains banks of 260-W lamps in gold-plated reflectors (288 lamps in all). Instead of the normal open tunnel of lamps, these are enclosed in a light-gauge steel shell which adds convection heating. An illustration in *Electrical West* shows paint-sprayed apparatus being passed through the tunnel on a conveyor chain. A six-pointed star welded to each hook upon which the sprayed material is hung engages with rods at intervals along the tunnel, causing the hook to twist round one-sixth of a circle. If the apparatus being dried is too large to turn, this device is put out of action.

The insides of steel drums in which fat or lard may be placed must have a tight and well-bonded coating of enamel. The Myers Barrel Co., of Oakland, recently installed two 12-kW infra-red baking tunnels to dry a liner on the inside of 55-gal. steel drums and on drumheads. So far this is the largest installation of infra-red apparatus in the San Francisco-East Bay region.

The two tunnels consist of 44 reflectors using 260-W carbon lamps. A drum is placed in the tunnel and rotated to give equal distribution of heat at a speed of 4 RPM for a period of 6 min., at the end of which the lining inside the drum is baked and after cooling is ready for use. The drum-rotating mechanism of both ovens is driven by one motor through a reducer and a series of belts and pulleys. The same mechanism also drives two vertical turntables on which the drumheads to be baked are placed.

Formerly it took 16 hours to air-dry the drums and heads. Now the job is done in 6 min. and the owner of the factory is said to be highly pleased with the results. He further claims that by former methods the exterior of the paint dried first, leaving the material nearest the steel drum soft for many hours. Often bubbles were formed on the surface by the escape of gases from the subsequent drying of the inner paint. However, with the infra-red method the drying seems to be done from the inside and to leave a hard non-porous surface which adds to the effectiveness of the liner for the drum.

Sag and Tension

Methods of Calculation

By M. P. Romeira

THE general solution of the problem of correct tensioning of transmission lines, so that the conductors are never subject to excessive tensions, even under the worst conditions of weather and windage likely to occur, is given in text-books by rather confusing and laborious formulæ.

The method described is believed to simplify greatly the work involved, without losing anything in accuracy or general applicability.

The following symbols are used:—

f = breaking strength in lb. per sq. in./safety factor.
f_t = maximum tension applied at erection (lb. per sq. in.).
a = coefficient of expansion.
E = modulus of elasticity.
t = difference between temperature during construction and minimum expected (deg. F).
w = weight of conductor, lb. per ft. run.
$W = w + w_i$ (w_i = weight of ice coating per ft. run).
d = diameter of conductor, inches.
d_o = " " " plus ice coating (= d + 2 × radial thickness of ice).
$\delta = w/\frac{\pi}{4} d^2$ (for solid conductors) and
$w/\frac{\pi}{4} d_s^2 \times n$ (for stranded conductors of n wires of dia. = d_s.)
l = length of span in ft.
P = wind load (lb. per ft. run).
k = tension factor, always < 1.0 (expressed as a decimal) giving $f_t = kf$.

As the wind load is generally given as W_ρ. lb./sq. ft. of projected surface, we write $P = W_\rho \times d_o/12$ (lb./ft. run), also $w_i = .31 (d_o^2 - d^2)$.

The following expressions can easily be calculated:—

(I) q^2 (loading factor) $= \frac{P^2 + W^2}{w^2}$ for ice conditions and $\left(\frac{P}{w}\right)^2 + 1$ for no-ice conditions

(II) $K_T = a t.E$

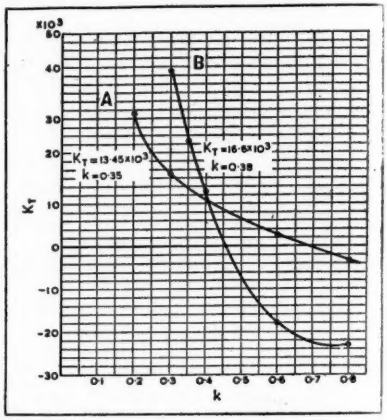
(III) $\beta = \delta^2 E/24$

(IV) $B = \beta\left(\frac{1}{f}\right)^2$

and the results, by substitution, form the general simplified equation:

(V) $B\left(\frac{1}{k^2} - q^2\right) + f(1-k) = K_T$.

This is most easily solved graphically by taking a few values of k (say = .8, .6, .4, .2) and plotting the resulting values of K_T against these values of k, as in the two examples shown in the accompanying figure. The first



Typical curves resulting from equation (V)

curve is for a stranded 0.15 sq. in. (7/.166) copper conductor to be tensioned for a safety factor of two at 122 deg. F. with a span length of 600 ft., the loading conditions being ½ in. of radial ice and 8 lb. per sq. ft. windage at a minimum temperature of 22 deg. The other curve relates to a steel-cored aluminium cable, 30/.102 in. and 7/.102 in., under similar conditions.

For the value of K_T obtained by equation (II) read off the required value of k. The required conductor tension $f_t = kf$. Hence sag (ft.) = $\delta l^2/8f_t$. For maximum swing from vertical get $\tan\theta = W_p.d/12W$, and maximum swing = $\sin\theta \times$ sag (ft.). The spacing between conductors is generally taken as equal to half the swing, where other electrical considerations do not rule otherwise.

New American Society

DR. M. L. Huggins of the Eastman Kodak Co., and Professor B. E. Warren, of the Massachusetts Institute of Technology, are respectively president and vice-president of the recently-established Society for X-ray and Electron Diffraction.

Earthing Systems and Tests

Resistance of Electrodes and Earth-Continuity Conductors

By "Rotor"

IN the event of an earth fault on electrical apparatus, such as the three-phase motor shown in fig. 1, the fault current will be limited by the impedance of the following conductors:—A, alternator or transformer at

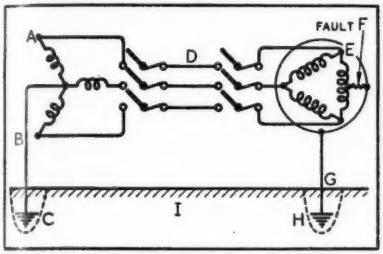


Fig. 1.—Earth fault conditions on a three-phase circuit

the supply plant; B, earth conductor at supply plant; C, resistance of earth electrode at supply plant; D, line conductors between motor terminals and fault; F, actual resistance of fault; G, earth conductor at the motor; H, resistance of earth electrode at the consuming plant; I, resistance of the mass of earth between supply-plant electrode and consumer's electrode.

Items A to D will be largely outside the control of the consumer taking a public supply, except possibly when supply is given through a step-down transformer on his premises. Item C will probably be very low with an urban supply, but if a transformer is used for a rural area the electrode may consist of buried plates, pipes or rods, in which case the resistance may be considerable. It can safely be assumed that A, B and D will be low. Items E and F, of course, cannot be controlled in any practical way, but G can be made as low as the consumer desires. Item I can be neglected. Item H will generally have a low resistance to earth if connected to the service pipe of a large underground water system, but if buried plates, pipes or rods are used the resistance may be high.

The resistance between a buried electrode and earth can be considered in two parts. The first is due to the actual contact resistance between the electrode and the surrounding layer of earth. When DC passes between the electrode and earth, electrolysis may be set up and cause a film of gas to be liberated round the electrode. A back EMF may be set up at the electrode so that the resistance with DC may be slightly higher than with AC. This component of earth electrode resistance is generally very low, however, and can be neglected. The greater part of the earth electrode resistance consists of the actual

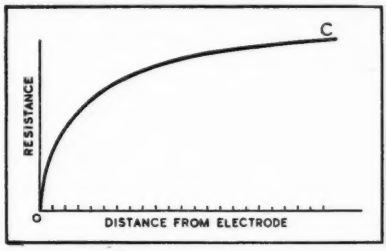


Fig. 3.—Variation of resistance between electrode and earth

resistance of the earth in the vicinity of the electrode; this depends on the size and shape of the electrode and the specific resistance of the soil.

Potential Gradient

The potential of the electrode is above that of earth when fault current flows and falls over the area of ground round the electrode somewhat as shown in fig. 2. The shape of this curve might be modified by factors such as soil of variable specific resistance, and presence of water or other conducting materials in the vicinity. The potential difference between points at different distances from the electrode can be measured with a low-reading voltmeter connected to two auxiliary electrodes.

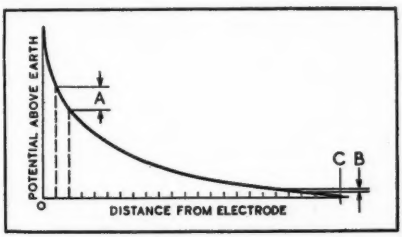


Fig. 2.—Fall of potential in the neighbourhood of an earth electrode

Generally it will be found that the potential gradient A will be much greater near the electrode than the potential gradient B between points 1 ft. apart some distance from

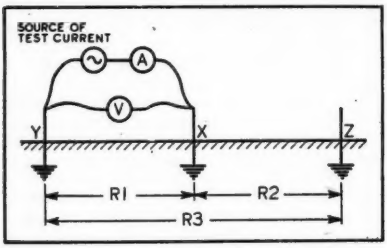


Fig. 4.—Three-point method of testing earth electrode

the electrode. The potential gradient around an earth electrode should be low under fault conditions, as animals have received fatal shocks due to their feet being at points of different potential. The potential gradient can be reduced by the employment of a large electrode.

The resistance to earth of the electrode can be represented by the curve in fig. 3. The resistance area of an earth electrode is defined in the I.E.E. Regulations as that area of ground round it within which a voltage gradient can be measured with ordinary instruments when the electrode is being tested. That is the area bounded by a point such as C, in figs. 2 and 3. At such a distance the voltage drop or gradient is negligible and the

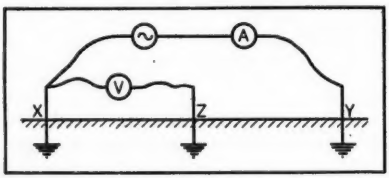


Fig. 5.—Another method of testing earth electrode

whole resistance between electrode and earth is included.

Tests of Earth Electrode

For testing the resistance to earth of the electrode a voltmeter, ammeter and double-wound transformer fed from the mains can be used. The three-point method employs two additional current-carrying earth connections situated some distance apart and from the permanent electrode. If the electrodes are too near together and are within each other's resistance area, the whole resistance to earth of each electrode will not be included. This will be seen from fig. 3. The main earth conductor is disconnected from the electrode and current passed between each pair of electrodes in turn, noting the voltmeter and ammeter readings.

In fig. 4 if R_1 is the resistance between the main electrode X and a temporary electrode Y—calculated by dividing the voltmeter reading by the ammeter reading—R_2 the resistance between X and Z, and R_3 the resistance between Y and Z, then the resistance to earth of X is equal to $\frac{R_1 + R_2 - R_3}{2}$.

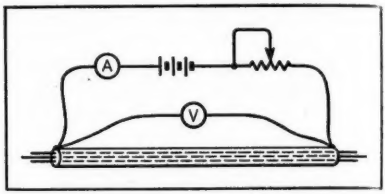


Fig. 6.—Testing resistance of earth-continuity conductor

An improved method of testing advised in I.E.E. Regulation 1107 employs two auxiliary electrodes Y and Z connected as shown in fig. 5. Current is passed between Y and the permanent electrode X, and the potential drop measured between X and the third electrode Z which is situated half way between X and Y. Provided Z is outside the resistance areas of X and Y, the earth resistance of X is then equal to the voltmeter reading divided by the ammeter reading.

To confirm that the electrodes are far enough apart the tests should be repeated, a test being made with Y 20 ft. nearer to X and

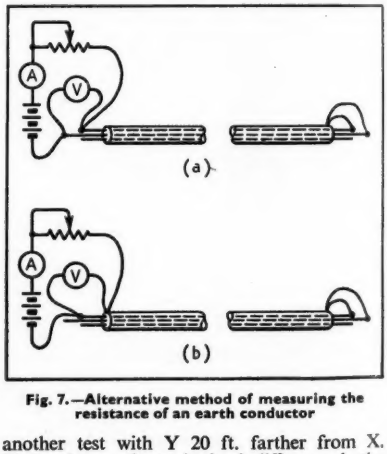


Fig. 7.—Alternative method of measuring the resistance of an earth conductor

another test with Y 20 ft. farther from X. If the three values obtained differ much the

tests should again be repeated with the electrodes much farther apart. If little difference is noted, the mean of the three values can be taken. Direct-reading self-contained sets are available for such tests.

The earth electrode resistance may vary from time to time, due to change in moisture content of the soil depending on weather conditions, and possibly due to solution of chemicals in the soil or corrosion of the electrode. Under fault conditions the passage of heavy current to earth, if allowed to continue for any length of time, may cause heating of the soil and increase of resistance. It is wise to carry out earth tests under different weather conditions and to allow a margin over the highest resistance obtained in order to give a factor of safety.

Earth-Continuity Resistance

The resistance of the earth-continuity conductor, connected between the framework of the plant and the earth electrode can be measured by the same apparatus as used for earth electrode testing. Alternatively, a voltmeter and ammeter can be used with an accumulator. A nickel-iron accumulator is best for this purpose, but if a low resistance accumulator is used a resistance can be connected in circuit to avoid possible damage to the accumulator from heavy discharge of current.

Fig. 6 indicates a suitable method of testing short conductors, the resistance of the continuity conductor, of course, being equal to voltmeter reading/ammeter reading.

It is generally more convenient to test long conductors when the circuit is out of use. The cable conductors can then be used to carry the testing current from one end of the earth conductor to the other. This method necessitates finding the resistance of the cable conductor as indicated in fig. 7a. A low resistance conductor is used to connect two cable cores together and to the continuity conductor (whether this be conduit, cable sheath, or a separate earth wire).

These test connections will enable the resistance of two cores in series to be obtained, and half the calculated value will give the resistance of one core. With the connections shown in fig. 7b the resistance of one cable core in series with the earth conductor is obtained; the cable resistance previously found is then subtracted to give the required resistance of the earth conductor.

Heavy flexible copper leads terminating in three strong clips will be found convenient for making the short-circuiting connections. If a few connections are made up it is a simple matter to short-circuit at the supply end and test from the other end, then short-circuit the next section and so move out towards the sub-circuits. When testing the resistance of a cable connected to a motor, it is best to short-circuit at the motor and test at the other end of the cable, thus avoiding the need to disconnect the motor for the cable-core tests.

America's Defence Needs

IN a report submitted to President Roosevelt the Federal Power Commission contends that the time has come for the United States Government to assume a larger share of responsibility for planning and financing the additional generating capacity required for the country's defence needs; for the latter purpose it is recommended that the Government should set up a subsidiary of the Reconstruction Finance Corporation.

Utilities, publicly and privately owned, should be given an opportunity to undertake commitments either directly or on a lease-purchase basis, and the Commission should be authorised to supervise the plan and to make arrangements for transfer of generating units to the systems as the situation requires. The U.S. Corps of Engineers, the T.V.A. and other agencies concerned should construct a series of river basin projects calling for the installation of approximately 1,000,000 kW of plant a year in accordance with the programme and schedule prepared by the Commission on the basis of the regional needs of the defence programme.

Orders should be prepared for steam and hydro-electric turbine generators sufficient to assure for the next five years full-capacity operation of the portion of the electrical equipment factories reserved for the manufacture of generators for public supply. Financial commitments should be made immediately for units to be completed in 1943 or 1944. The plan works out the proportion of generating units of various sizes which best fit manufacturing schedules and assumes standardisation to the maximum possible extent and also a proper balance between hydro and steam projects.

At the same time that the Commission's recommendations were being forwarded a White House conference on power submitted to President Roosevelt a plan for the construction of several generating units at existing dams to meet the power shortage, including a steam plant at Central Valley and more generating facilities at Bonneville, Boulder Dam and Grand Coulee.

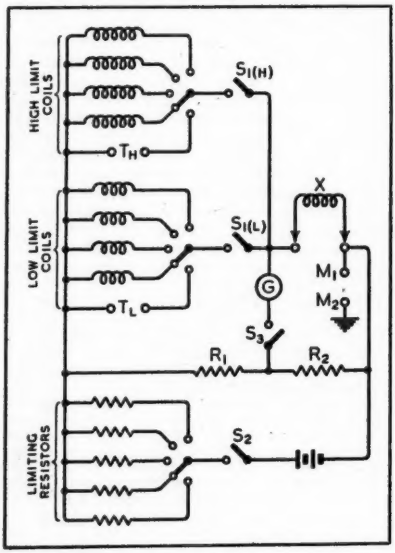
Writing in the *Electrical World*, Mr. J. A. Krug, chief power consultant of the Office of Production Management, says that electricity now leads the list of defence needs, pointing out that the production of aluminium and magnesium alone will require well over 2,500,000 kW. One medium-sized plant for the production of these metals consumes more power than an entire metropolitan area such as Minneapolis, Cincinnati or Seattle. While the aluminium or magnesium plants themselves can be constructed in from six to twelve months, the installation of economical generating plant requires 18 to 30 months, and interim requirements for power can be met only by the pooling of resources, maximum use of reserves and in some cases curtailment of non-essential uses. He therefore urges the establishment of a general reservoir of power, with the dropping of public-private differences, and the standardisation of types and sizes of equipment.

Production Coil Testing

A Convenient and Rapid Method

By H. G. Dunn and E. A. Farthing

WITH the advent of the drive for increased production in aircraft equipment the usual methods of resistance checking of relay coils, resistance bobbins, etc., were found to absorb a considerable amount of labour and valuable equipment, as the number of coils to be tested rose steadily. Some means of increasing the speed of testing without wasting labour or equipment became vital, and it was decided that the method here outlined would assist materially in keeping pace with a rapidly growing output schedule, whilst still retaining the accuracy in checking which was essential.



Bridge circuit for production checking of different types of coil

(Ganged selector switch shown as five-way for simplicity is actually eleven-way.)
M_1 and M_2, "Megger" terminals for metal cored coils. X, coil under test. R_1 and R_2, ratio arms (1 : 1). G, galvanometer or microammeter. T_H and T_L, terminals for extra limit coils.

After six months' use of the new equipment, the output of tested coils per hour is more than five times that obtained by using the more usual means of resistance measuring and the accuracy of measurement is fully equal to that obtained on a standard bridge. A measure of the success obtained is that a duplicate set has recently been put into service and 20,000 coils of some twelve types can now be dealt with per week—all at a cost of less than £30 for the two sets of equipment. In consequence, it is felt that firms engaged in the manufacture of similar equipment may be interested in details of the apparatus in use.

The circuit is that of the Wheatstone bridge, except that standard production coils, adjusted accurately to the top and bottom resistance limits at 60 deg. F., are used in place of adjustable decade resistors. This use of production coils has the advantage that the coils under test have the same temperature and temperature coefficient as the standard coils. No calculations are necessary to correct for temperature as with other forms of resistance testing, providing the coils are allowed to reach normal ambient temperatures before they are checked. Errors due to a difference in temperature between the standard coils and those under test can then only be due to careless handling of the latter. In practice these errors rarely exceeded 0.1 per cent. even on small coils wound with copper wire.

Apparatus Needed

The components required consist of a galvanometer, a radio-type ganged selector switch, a positive action single-pole double-throw switch, two meter push switches, six terminals, two spring clips, a 1.5-V dry cell, two 25-ohm manganin ratio arms, and standard coils as required.

Switching is arranged so that any particular pair of standard coils may be placed in circuit and this setting remains fixed until it is necessary to change over to another set of coils. Either the "high" coil or the "low" coil is switched in by means of the positive action single-pole double-throw switch S_1. The battery and galvanometer circuits are closed by one push-button switch carrying four contacts so arranged that the pair connecting the battery into circuit close before the pair connecting the galvanometer. The switch was made up specially but the two switches noted can be used equally well, provided a simple lever is fitted so that the battery switch contacts are closed before those of the galvanometer.

The plan is that, assuming the coil under test to be within the limits set by the standard coils, when the "high" coil is in circuit and the battery and galvanometer are connected, the galvanometer indicates "low," *i.e.*, the test coil

is of lower resistance than the standard in circuit. On changing over to the "low" standard the galvanometer will indicate "high." Thus, with a coil within the specified limits the galvanometer will kick first in one direction and then in the other. If this kick is too violent limiting resistances can be inserted, as shown in the wiring diagram. On the other hand, it can be seen that a coil having a lower resistance than the specified values will give two low readings, while one of higher resistance will give two high readings.

Operators have now become so used to these indications that "two high" automatically signifies "too high" and "two low" equally automatically signifies "too low," which easily and positively ensures that no coils outside the limits pass the tests.

Care must be taken in constructing the test board to ensure that the ratio arms are wound with manganin or ferry wire and are of exactly the same resistance. All connections must be of heavy-gauge copper wire and of equal length on either side of the bridge. All standard coils must be adjusted so that at 60 deg. F. their resistance is that specified. Apart from some slight adjustments to the switching, no trouble has been experienced over a period of six months on the first of these boards, on which more than 100,000 coils have been tested.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Welding Electrodes

A NEW addition to the extensive range of electrodes marketed by MUREX WELDING PROCESSES, LTD., Hertford Road, Waltham Cross, Herts., is the versatile "Nicrex" alloy that deposits metal containing relatively large proportions of nickel and chromium which are so balanced as to combine resistance to both corrosion and heat. It is capable of forming true junctions with nearly all carbon and alloy steels, avoiding the martensitic brittleness that tends to occur when joining hard to mild steel. It is also suitable for welding non-magnetic inserts to mild steel switch boxes, and building up Pelton water-turbine buckets and furnace parts.

The deposited metal is claimed to be exceptionally ductile and its mechanical properties are not impaired by dilution with the parent metal, since the amount of interfusion is very small. The high electrical resistance of "Nicrex" core wire necessitates close adherence to the welding current values recommended by its makers, which range from 40 A for 14 gauge to 190 A for 4 gauge electrodes.

Instrument Test Panel

A test panel for general laboratory use has been developed by SALFORD ELECTRICAL INSTRUMENTS, LTD., Silk Street, Salford, 3, Lancs., as a convenient means of furnishing AC energy for the calibration of voltmeters and ammeters. It is self-contained, comprising a number of transformers so arranged that their primaries are fed from a continuously variable transformer which in turn is energised from a variable tapped choke connected to 50-cycle, 230-V mains.

Continuous stepless variation from zero to maximum output is obtainable on each of the ten ranges provided, the first up to 50 mA at 600 V and the tenth up to 1,000 A at 2 V. In addition, by pre-setting the load-factor switch in the centre of the panel at the top, the maximum voltage output on each range may be reduced to three-quarters, one-half, one-quarter, or one-tenth. The maximum burden ranges from 30 to 2,000 VA.

Six miniature circuit-breakers afford overload protection for the several circuits, none of which can be used without first closing at least three switches, so that the possibility of committing an error that would damage the equipment is remote. All the transformers operate at very low flux densities, thus ensuring that the output is free from wave-form distortion. Panels for non-standard mains voltages and frequencies can be designed, and reasonably good delivery is promised for orders with suitable priority symbols.

Instrument test panel for AC calibration

Substitute for Wire

Real economies in cost and the utilisation of steel are made possible by the employment of a wartime fibre substitute for metal wire for baling paper and other waste materials, or packages, because there is said to be more "yardage" in a ton of "Balax" than in the equivalent weight of wire. This material is produced by BRITISH ROPES, LTD., Anchor & Hope Lane, Charlton, London, S.E.7, subject to the Hemp Control Section of the Ministry of Supply. Licences to spin three months' supply for users whose stocks are small may be authorised provided the appropriate form accompanies each order placed.

COMMERCE and INDUSTRY

Salaries at Croydon. Production Engineering.

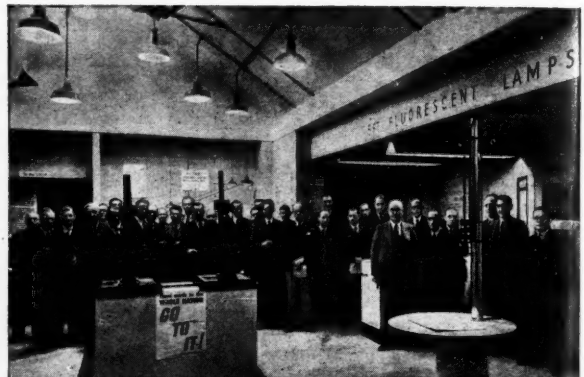
Croydon Clerical Staff Salaries

At a recent meeting of Croydon Town Council the question of the salaries paid to the clerical staff was raised by Councillor A. L. Boddington, chairman of the Electricity Committee. Unless the Council agreed to pay the cost-of-living bonus recommended by the National Association of Local Government Officers, he said, the provisional certificate for the electricity undertaking issued by the Ministry of Labour and National Service under the Essential Works Order might be jeopardised. The matter was of vital importance as the undertaking was suffering from the drain on its staff through members being called to the Forces, and the scheduling of the undertaking would stop that drain. He had spoken to the town clerk who informed him that the Establishment Committee did not propose to make any recommendation in the matter. No member of the Electricity Committee had been invited to attend the meeting of the Establishment Committee when the question was discussed. He proposed that the report of the Establishment Committee on the matter should not be approved.

Councillor J. Edwards, seconding the amendment, said it was important that the clerical staff should be included in the cost-of-living bonus in order that there should be uniformity in the Electricity Department.

Councillor Maycock stated that an additional expenditure of between £15,000 and £20,000 might be involved.

The amendment proposed by Councillor Boddington was carried by a large majority.



Members of the A.S.E.E. at the Lighting Service Bureau

Insurance of Goods Containers

The Board of Trade has made an Order amending the War Damage (Business Scheme) Order, 1941, to permit insurance under the Business Scheme on a voluntary basis of various goods, including containers for the supply of goods, of a value not exceeding £5 each, which are owned by the supplier, but are not in his possession.

Science and Humanity

A three-day conference of scientists and public men, representing the British Empire, the United States, Russia and China and allied countries, is being arranged by the Division for Social and International Relations of Science of the British Association. It will be held at the Royal Institution from September 26th to 28th, and the sessions will be under the chairmanship of Sir Richard Gregory, President of the British Association, the American, Russian and Chinese Ambassadors, the President of Czecho-Slovakia and Mr. H. G. Wells.

The purpose of the conference is " to demonstrate the common purpose of men of science in ensuring a post-war order in which the maximum benefits of science will be secured for all people." At the close of the conference Sir Richard Gregory is to put forward a " new charter of scientific fellowship."

Lighting Service Bureau Visits

Recently representatives of the Society of Motor Manufacturers and Traders and the Association of Supervising Electrical Engineers visited the E.L.M.A. Lighting Service Bureau. These were the first of the visits from associations and institutions which have been planned throughout the coming months and for which the Bureau is reserving Wednesday afternoons.

Iron and Steel Order

The Ministry of Supply has issued the Control of Iron and Steel (No. 15) Order, 1941, Direction No. 2, which came into force on August 31st and extends until September 30th, the period during which orders for all iron products, except pig iron but including iron castings, may be fulfilled without being authorised by the responsible Government Department. This extension applies only to orders placed before September 1st, which would not have had to be licensed if the No. 8 Order had remained in force. The exemption from licence or other authority of small pur-

chases of iron castings has been extended from quantities not exceeding 2 cwt. to quantities not exceeding 5 cwt. Copies of the Direction may be obtained from H.M. Stationery Office, York House, Kingsway, London, W.C.2, or any bookseller.

Contractors' Year Book

The 1941-42 Year Book just received from the Electrical Contractors' Association, Africa House, Kingsway, W.C.2, although thinner than its immediate predecessors is still a substantial volume (327 pp.) and the reduction has not materially affected its value. The deleted sections are the alphabetical list of members (the geographical list remains) and the tables of supply voltages, etc., while the rather confusing collection of wages agreements has been reduced and clarified, which is actually an improvement. There is, of course, no conference report and it has been considered unnecessary to repeat the annual report which has already appeared in the Association's official journal. The price remains at 5s. net.

Lamp Publicity

Difficulties of obtaining raw materials will restrict the quantity of publicity matter concerning the "Elasta" electric lamps, of Pope's Electric Lamp Co., Ltd. The principal display piece available to dealers is a cut-out, shown in the accompanying illustration, about 25-in. by 20-in., printed in attractive colours and stressing that "Elasta" coiled-coil lamps give up to 20 per cent. more light. This will be still further emphasised by announcements in the trade Press. Good stocks of lamps have been gradually built up at all distributing centres.

The new "Elasta" cut-out

Limit and Fit Gauges

Manufacturing and inspection tolerances are the subject of two recently issued specifications. The tables in BS.164, which is concerned with "limits and fits in engineering," are identical with those of 1924, but the text has been completely rewritten and considerably amplified. It includes definitions in explanation of hole and shaft basis systems as well as unilateral and bilateral systems together with recommendations that should assist designers to select appropriate tolerances for the class of workmanship and type of fit required.

BS.969 deals with "tolerances for plain limit gauges" (being complementary to the recently issued BS.919 on "screw thread gauge tolerances") and explains comprehensively the relationship between work and gauge tolerances and their disposition on both workshop and inspection gauges in relation to the limits of the work. There are tables of appropriate plug and gap and ring gauge tolerances from 0.0003 to 0.2 inch, the manner of stating them on drawings and of marking the gauges themselves being also outlined.

Copies are obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 3d. each, post free.

Value of "Production" Technique

Speaking at the opening meeting this session of the North-Eastern Section of the Institution of Production Engineers, of which he is president, Mr. W. A. Harriman, M.B.E., a director of A. Reyrolle & Co., Ltd., expressed the view that the gravitation of industries from the North-East area was due largely to the better production organisation and technique available in other districts.

After referring to the range of engineering inventions for which Tyneside in particular was famous, Mr. Harriman asked whether the large number of light industries which had been started in the Tyneside area and had moved to other centres did not show a neglect of production technique. Production engineering meant the manufacture of goods in the best and the cheapest possible manner, by scientific methods, and not by undercutting rates of pay or wages.

He felt that the lack of this production mentality was one of the causes why we could not compete in the world markets during the depression preceding the war. The science of production engineering could help the country at present, but the greater benefit would be felt when the world's markets were once more happily open for international commerce.

A.S.E.E. Papers Scheme

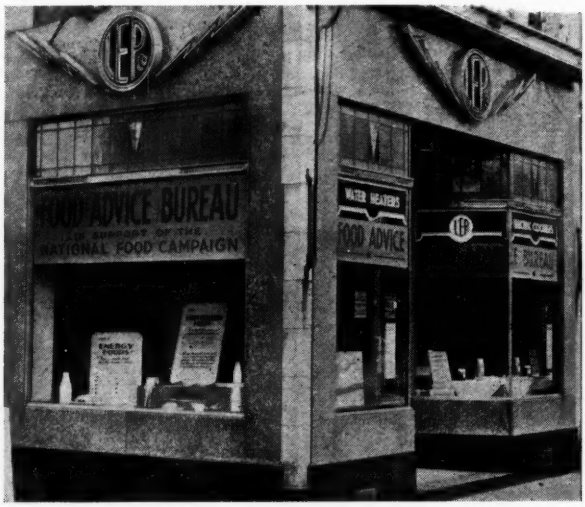
To encourage the preparation and reading of papers by its members, the Association of Supervising Electrical Engineers has instituted a system of rewards. Members are invited to write papers not exceeding 2,000 words in length for presentation at branch meetings during the period from April to September next year. As soon as possible after their reading copies of the papers should be sent to the Secretary of the Association for inclusion in a competition for prizes; it is stipulated that not fewer than three papers must be submitted from each branch.

The author of the paper adjudged the best will be awarded a prize of four National Savings Certificates. The second and third prizes will comprise two and one Savings Certificates respectively and additional prizes may be awarded if it is deemed advisable.

The principal aim of the scheme is to stimulate discussion on practical problems which should help the Association to keep its educational side going during the war and be of considerable benefit to the authors and members of the branches.

L.E.P. Food Advice Bureau

The Lancashire Electric Power Co. has found that many consumers when calling to pay their quarterly accounts take the opportunity of discussing their food difficulties. The company has therefore opened a food advice bureau at its Whitefield branch. While the bulk of the inquiries are for recipes to eke out the scarcer foodstuffs and for hints on jam making, individual cases have been helped, including diabetics, and demonstrations showing the preservation of fruit and vegetables have proved very popular.



An L.E.P. Food Advice Bureau

Tin Statistics for July

According to the Statistical Bulletin of the Tin Research Institute, the world production of tin in July is estimated at 18,100 long tons, compared with 19,900 tons in July, 1940.

German Control in Occupied Countries

According to the *Kölnische Zeitung*, quoted by the *Sunday Times*, the Standard Elektricitäts Gesellschaft has during the past year assumed control of the following concerns in the countries over-run by Germany: The Bell Telephone Manufacturing Co., Antwerp; the Cie. Générale de Constructions Téléphoniques, Paris; Matériel Téléphoniques, Boulogne-Billancourt; Standard Telephone og Kabelfabrik A/S, Oslo; Standard Electric A/S, Oslo; and Standard Electric A/S, Copenhagen.

Fire-Watching Summonses

Three employees of the Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board were prosecuted, on the instructions of the Electricity Commissioners, for failing to carry out fire-watching duties at the Hartshead power station. Two defendants were ordered to pay in fines and expenses a total of £15; the third defendant was fined £5.

Fatality

A verdict of death by misadventure was returned at a Manchester inquest last week on a 13¼-year-old boy who received a fatal electric shock from a radiator bought for 5s. from a hawker. The boy's father said he bought the radiator to place in his cellar air-raid shelter. An official of the Corporation Electricity Department stated that the apparatus was "alive," as the earth wire had become disconnected.

New Catalogues

Elliott Bros. (London), Ltd., Century Works, Lewisham, London, S.E.13.—List 840 (revised) of electrical distance thermometers. Many modifications have been incorporated and some new illustrations are included showing the latest developments of these instruments. Photographs also show recent applications. Descriptions of the bridge cross and the null systems are particularly interesting in view of their use in connection with cold stores, grain elevators, food manufacture and processing, and also for chemical works, heating, ventilating and air conditioning plants, etc.

B.E.N. Patents, Ltd., Hughenden Avenue, High Wycombe, Bucks.—Priced and illustrated leaflet (G.B. 61) describing spray painting guns and accessories.

Trade Announcement

Mortimer, Gall & Co., Ltd., 115/117, Cannon Street, London, E.C.4, have acquired the sole selling rights for the "Radiovisor" auto fire-bomb detector.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

SAEVMAID vacuum cleaner.

AGEITE accessories.

ELECTRICITY SUPPLY

Belfast Undertaking's Future. Tadcaster Purchase Rights.

Bolton.—COTTAGE INSTALLATIONS.—The Corporation Cleansing Committee has agreed to install electricity in place of gas at cottages in Wellington Street subject to the rents being proportionately increased.

Bournemouth. — HEATING IN SHELTERS. — The borough engineer recently reported to the Emergency Committee that conditions governing the use of electric heating in shelters had been laid down by a British Standard Specification. Having regard to the fact that the installation of electric fires in shelters had already been approved, the Committee decided to ascertain what further steps should be taken. In the meantime the borough engineer was instructed to prepare a scheme for the protection of heaters by wire guards and for the protection and fixing of the cables connecting the fires to the electric points. It was further reported that the Ministry of Home Security had suggested that some form of dimming should be provided for the lighting in shelters, and the engineer was instructed to prepare a scheme for the provision of hinged metal covers with a narrow aperture which can be clipped over the lights to produce a dimming effect.

Cheltenham.—PROTEST AGAINST PYLON SITING.—At a recent meeting of the Corporation Highways Committee the borough engineer reported that a number of pylons had been erected and that some of these would seriously affect the amenities of the district. The town clerk was instructed to write to the Central Electricity Board protesting against the amenities being spoilt by the bad siting of the pylons.

Coventry.—PROPOSED NEW SUPPLY.—The Corporation Electricity Committee is seeking sanction to borrow £3,128 in connection with the provision of a new supply.

Darlington.—LOAN.—The Town Council is seeking sanction to a loan of £1,000 for mains and services.

Durham.—ASSESSMENT APPEAL.—The hearing of the appeal by the North-Eastern Electric Supply Co., Ltd., against the assessment of the company's undertaking in Co. Durham, has been provisionally fixed for September 30th.

Glasgow.—INSTITUTION HEATING.—The Corporation Health Committee has approved a proposal of the medical officer to increase heating at Lennox Castle Institution for maternity accommodation by means of electrical tubular and panel heaters, and has agreed that the necessary work should be carried out through the Electricity Department at an approximate cost of £295.

Manchester.—MOBILE GENERATING UNIT.—The Watch Committee is to purchase a transportable alternator for the provision of an alternative supply to police premises.

Northern Ireland.—BELFAST UNDERTAKING'S FUTURE.—At the monthly meeting of the City Council on September 1st sanction was given to the raising of a loan of £200,000 for the working expenses of the Electricity Department. Alderman T. Henderson, M.P., again made reference to the rumoured possibility of the undertaking being taken from the Council, which he said might result in an increase in the cost of electricity to consumers of about 20 per cent. He said he had heard a lot about secret negotiations taking place and that there was a possibility of the undertaking being transferred this year. Councillor S. B. Thompson, chairman of the Electricity Committee, replied that although they were not responsible to the Ministry of Commerce they were prepared to meet the Ministry to discuss anything they wanted to say. Nothing definite had been done. With regard to the loan, it was explained that such advances had been made in previous years.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £6,355.

Stalybridge.—SHELTER INSTALLATIONS.— The Corporation Education Committee, having inspected a shelter where an electric heater and electric lighting have been temporarily installed, has decided that all school shelters should be so equipped.

Stretford.—LIGHTING AND HEATING SHELTERS.—Sanction has been obtained by the Corporation Emergency Committee to spend £6,608 for heating and lighting 197 shelters.

Swinton and Pendlebury.—SHELTER LIGHTING.—The Town Council has decided to have electric lighting installed in a further thirteen public air-raid shelters.

Tadcaster.—OPTION TO PURCHASE UNDERTAKING.—It was reported at the last meeting of the Rural District Council that Electrical Distribution of Yorkshire, Ltd., had asked the Council to give an undertaking not to exercise its rights of purchase of the Tadcaster Electricity Co. in 1944. The Finance and General Purposes Committee recommended that the Council should agree to the suggestion provided it could legally commit the authority in 1944 to that decision. After an amendment had been moved that the Council should not agree to the suggestion, the clerk explained that in view of the conversion from DC to AC which would be necessary the committee was of the opinion that there would be no possibility of the Council wanting to buy out the Tadcaster Co. The amendment was defeated by 12 votes to eight.

Wallasey.—SCHOOL SHELTER LIGHTING.—The Corporation Education Committee has asked the Electricity Department to arrange for the lighting of shelters.

Worcester.—REDUCED DISCOUNT PROPOSED.—A reduction in the discount for prompt payment of electricity accounts from 10 to 5 per cent. is recommended. The proposed alteration applies to all tariffs except those including a coal clause, in which case the existing tariffs and discounts will be continued. This step is suggested in consequence of a report by the city electrical engineer giving a revised estimate of income and expenditure for 1941–42 which indicated an increase in the

estimated deficiency. The Tariff and Works Sub-committee was unanimously of the opinion that existing tariffs should not be continued at the risk of the reserve fund being called upon to make good a deficiency. It was felt that the reserve fund should be kept at least at its present figure in order to meet any post-war contingency.

COAL SUPPLY.—Following correspondence between the city electrical engineer and the coal supplies officer for the Warwickshire district regarding deliveries of fine screenings, it is proposed to purchase a crusher which, with the necessary alterations, would cost £1,600. The scheme has been submitted to the Central Electricity Board for approval.

TRANSPORT

London.— BATTERY VEHICLE CHARGING FACILITIES.—In a recent report presented to the Hackney Works and Open Spaces Committee it was stated that the present system of charging electric vehicle batteries involves the garaging of the whole electric dust-collection fleet in one place. The establishment of other charging stations within the borough has been considered, and also the erection of auxiliary charging panels for use in an emergency. It is possible to make temporary arrangements for charging at three places at a cost of £240, and the Finance Committee has approved this expenditure.

Electricity in the Empire

Presidential Address to London I.E.E. Students

THERE was an attendance of 100 members of the London Students' Section of the Institution of Electrical Engineers on August 27th to hear Mr. J. R. Beard, M.Sc., deliver his presidential address on "Electricity Supply in the British Empire."

After deprecating the tendency of engineers to over-specialisation in the technical aspects of their profession to the neglect of their duty to guide and assist the general development of the community, Mr. Beard referred to the influence which the problems of post-war development throughout the Empire would have on the lives and careers of many of his audience. It was almost impossible to visualise the extent of potential developments of electricity supply in these vast lands, many of them at present only sparsely inhabited and only slightly developed industrially, and as this country was the manufacturing centre for the Empire, these developments would form an increasingly important part of our electrical industry for many years to come. Apart from the larger countries, the smaller possessions also offered a great potential field for future development.

To give some idea of the Empire trade in electrical goods he gave the following values of electrical manufacturing production in this country:—

For Home use		£109,000,000
Exports to the Empire:		
Australia	£3,700,000	
Canada	503,000	
Eire	600,000	
India	3,103,000	
New Zealand ..	1,750,000	
South Africa ..	4,650,000	
Colonies, etc. ..	3,700,000	18,000,000
Exports to Foreign Countries		7,000,000
Gross output		£134,000,000

In 1938 the United Kingdom supplied the following percentages of the total imports of electrical machinery and goods of Empire countries:—Australia, 70; Canada, 16; India, 51; Eire, 66; New Zealand, 61; South Africa, 60. Electrical manufacture in Australia in 1938 amounted to £5,200,000 and in Canada to £20,000,000, while there was also some small production in New Zealand, India, South Africa and Eire.

In a brief review of electricity supply in various parts of the Empire, Mr. Beard showed that in Canada hydro-electric undertakings supplied 98 per cent. of the total annual requirements, and general consumption was very high, about four times that in Great Britain. The American standards of 110-115 V, 60 cycles dominated Canadian practice. In New Zealand water-power was responsible for 90 per cent. of the annual output. The Public Works Department had formed a complete interconnected system in each island; at present in North Island there was 194,000 kW of installed generating capacity, with a further 174,000 kW under construction, and in South Island there was 73,000-75,000 kW, with 77,000 kW under construction. The average consumption was high—about 1,000 kWh per head. The standard distribution voltage was 400/230 V.

In Tasmania approximately 1¾ million HP of hydro-electric power was available, a considerable part being used for chemical manufacture. The largest stations (Waddamana, Shannon and Tarraleah) had a total capacity of 115,000 kW. With regard to the mainland of Australia, two interesting generating stations were the 75,000-kW installation at Balmain, N.S.W., where the turbines operated at a steam pressure of 1,200 lb. per sq. in. at 900 deg. F., and the 175,000-kW Yallourn station, Victoria, which utilised brown coal from adjacent surface mines. He also referred to the N.S.W. Railways (311 track miles electrified) and the Melbourne electrified suburban railway system (439 track miles). There was no complete standardisation of voltage in Australia; thus while Sydney, Adelaide, Brisbane and Tasmania distributed at 415/240 V, Victoria used 400/230 V and Perth 440/250 V. Frequencies were 25 and 50 cycles.

India could not be regarded as highly developed electrically, since the total consump-

tion averaged only 5 kWh per head. Hydro-electric undertakings existed mainly in the N.W. Frontier district, the Punjab, the Tata group near Bombay, and in Madras and Mysore. Steam generation predominated in the United Provinces, Calcutta and Hyderabad. The industrial districts of Calcutta, Bombay and Madras were, of course, the most highly developed electrically, the cotton industry being outstanding, and there was a certain amount of electrification of the G.I.P. railway system.

In the Far East, development was confined to the chief towns, such as Rangoon, Singapore and Hong Kong, though the electrification of the important tin-mining area served by the Perak River undertaking should not be overlooked.

Apart from development in the neighbourhood of the chief towns in South Africa, the electricity supply for the Natal railway had been tapped at intervals to serve outlying towns. There was also the Victoria Falls undertaking with 500,000 kW of plant; and there was a further 500,000 kW near the Witwatersrand, largely used for the extensive gold-mining industry, but in this district the restricted water supply made further extension of the steam plant difficult. The influence of Continental practice in South Africa should be noted, due to the strong Dutch interest, and the standard supply voltages were 380/220 V.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Telephone Rentals, Ltd.—Presiding at the annual meeting held on September 4th, Mr. F. T. Jackson (chairman and managing director), said that although he was not able to go fully into the activities of the operating companies during the year under review, they were all busily engaged. They had experienced considerable difficulties arising through shortage of labour and materials, but these had been recognised by the authorities and the position was now much more satisfactory than it was some months ago, and they would be able to secure supplies of the most important apparatus they used and to retain the necessary skilled labour to maintain the large number of instruments they had installed. Their operating companies were not only successful in maintaining their position, but had added a considerable number of new subscribers.

So far as the new year was concerned, they had various difficulties to face, particularly in connection with increased cost of materials and rising wages, and other charges arising out of the war. They had therefore approached their subscribers asking them to agree to a small increase in the annual rents, and the majority of the subscribers had agreed to the increase. As to future progress, demand for their installations continued on a satisfactory scale.

Rheostatic Co., Ltd.—An extraordinary meeting has been called for September 9th to consider a proposal to convert the issued preference and ordinary shares into stock transferable in units equivalent to their present nominal value of 10s. and 4s. respectively.

Thorn Electrical Industries, Ltd.—At last Monday's annual meeting Mr. Jules Thorn (chairman and managing director) said that the results were very gratifying in view of the difficulties encountered during the past year. An additional lamp factory acquired during that period had not only provided an alternative source of supply but had also increased their productive capacity. They had also built a lamp-cap factory.

Substantial lamp contracts had been secured, but there had inevitably been a curtailment of their radio and domestic appliance activities. They had adapted themselves to the changed conditions, but the full results had not yet become apparent. Export business had been greatly accelerated; their export order book was nearly two and a half times as large as in the preceding year.

Rawlings Bros., Ltd., report a profit for the year to March 31st of £3,261, as compared with £5,692 for the preceding year, plus £4,080 from the sale of two of the company's leasehold properties. The ordinary dividend for the year is maintained at 7½ per cent. and the balance carried forward is £3,658 (against £3,736 brought in).

Cammell Laird & Co., Ltd., have declared an interim dividend on the ordinary stock of 4 per cent. actual (2.4d. per 5s. unit), less tax (unchanged).

The British Columbia Power Corporation is again paying a quarterly dividend of 50 cents.

New Companies

Breton & Knight, Ltd.—Private company. Registered September 1st. Capital, £100. Objects: To carry on the business of manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, insulators, electrical plant, appliances and supplies, etc. Abram Aronovsky is permanent managing director. Registered office: Bright Works, Valley Road, Shipley, Yorks.

Acoustical Manufacturing Co., Ltd.—Private company. Registered August 30th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, and dealers in, electrical appliances, batteries, gramophones, sound reproducing machines, wireless and electrical components and equipment, etc. Directors: P. Walker, 138, Wardour Street, W.1, and such other person as may be appointed by the subscribers. Secretary: S. J. Jack. Registered office: 36, Long Lane, Finchley, N.3.

Powerlite Electrical Installations, Ltd.—Private company. Registered September 2nd. Capital, £1,000. Objects : To carry on the business of electrical engineers and contractors, etc. Directors: L. E. Blackler, C.A., The Croft, Aultone Way, Sutton, Surrey; J. Brand, 32a, Buckingham Place, Brighton; R. J. Byers, 59, Winifred Road, Coulsdon, Surrey; and A. Hammond, 31, Sunlight Road, Bolton, Lancs. Registered office: Kendells Works, Stafford Road, Croydon, Surrey.

Telesignal Electrical Co., Ltd.—Private company. Registered August 29th. Capital, £1,000. Objects: To carry on the business of electrical, mechanical, motor, cable, radio and television engineers, etc. Subscribers: S. S. Fisher, 90, Village Way, Pinner, Middlesex, and C. J. Auerbach, 48, Crown Street, Reading. Secretary: S. S. Fisher. Registered office : Hope House, Great Peter Street, S.W.1.

Francis & Stevens, Ltd.—Private company. Registered August 27th. Capital, £100. Objects: To carry on the business of merchants and manufacturers of machinery, electrical appliances and hardware, etc. Directors: J. E. Francis, 2, Caxton Street, S.W.1, and R. J. Stevens, "Dunoon," Coombe Lane, Kingston Hill, Surrey. Registered office: "Dunoon," Coombe Lane, Kingston Hill.

Preston Lift Components, Ltd.—Private company. Registered in Edinburgh August 22nd. Capital, £500. Objects: To carry on the business of manufacturers, sellers, hirers and repairers of and dealers in lifts, hoists, etc. Subscribers: P. Preston, 4, Napiershall Street, Glasgow, N.W. and W. Garner, 7, Barterholm Road, Paisley.

Cyffylliog and District Electricity Supply Co., Ltd.—Private company. Registered September 2nd. Capital, £1,200. Objects: To acquire the business of a producer and distributor of electrical current carried on by Richard E. Searle at Cyffylliog, Denbigh. Directors: R. E. Searle, 31, Sefton Street, Liverpool (managing director), and T. M. Lloyd, Mæsaleg, Cyffylliog, Ruthin. Solicitors: Wm. Jones and Talog Davies, 16, St. Peter's Square, Ruthin.

Repetition Engineering Services, Ltd.—Private company. Registered September 3rd. Capital, £1,000. Objects : To carry on the business of mechanical and electrical engineers, ironmasters, shipwrights, etc. Subscribers : J P. Stonehouse, Popes Cottage, Cheltenham Road, Painswick, Glos., and R. K. Allen, 12, Nevern Road, S.W.5. Solicitors : Bulcraig & Davis, Amberley House, W.C.2.

Companies' Returns

Statements of Capital

Clarke, Chapman & Co., Ltd.—Capital, £550,000 in 7,000 preference shares of £10 and 480,000 ordinary shares of £1. Return dated March 14th, 1941. 6,985 preference and 480,000 ordinary shares issued and fully paid up. Mortgages and charges: Nil.

Alert Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated April 15th, 1941. 711 shares taken up. £711 paid. Mortgages and charges: Nil.

Melton Mowbray Electric Light Co., Ltd.—Capital, £60,000 in 12,000 shares of £5 each. Return dated May 7th, 1941. 9,600 shares taken up. £48,000 paid. Mortgages and charges: £19,100.

Cornwall Power Co., Ltd.—Capital, £400,000 in 250,000 ordinary and 150,000 preference shares of £1 each. Return dated May 7th, 1941. All shares taken up. £190,007 paid. £209,993 considered as paid. Mortgages and charges: Nil.

Starkie & Sparkes, Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1 each. Return dated May 2nd, 1941. All shares taken up. £1,000 considered as paid. Mortgages and charges: Nil.

Increases of Capital

Micalectric, Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Mortgages and Charges

Underwood (Electric), Ltd.—Assignment of moneys due under contracts, dated August 13th, 1941, to secure all moneys due or to become due from the company to Martin's Bank, Ltd., not exceeding £6,900.

Kelvin Norton Electric Co., Ltd.—Charge on proceeds of a certain contract, dated August 20th, 1941, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

United River Plate Telephone Co., Ltd.—Issues between January 14th, 1941, and June 10th, 1941, of debentures for 8,000,000 Argentine pesos, parts of a series already registered.

Liquidations

Napier & Wheeldon, Ltd.—Meeting pursuant to section 236 of the Companies Act, 1929, on October 1st at Victoria Chambers, Bowlalley Lane, Hull, to receive an account of the winding-up by the liquidators.

Zeiss Ikon, Ltd.—Winding up voluntarily Liquidator, Mr. E. D. Miller, 150, Southampton Row, W.C.1, appointed August 29th.

Bankruptcies

Major Manufacturing Co., battery manufacturers, 98, Great Tower Street, London, E.C.—First meeting September 12th and public examination October 24th, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

L. Jacobs, radio dealer, 27, Crownstone Court, Crownstone Road, Brixton, S.W.2 (lately carrying on business at 162, High Street, Peckham, S.E.15).—Trustee, Mr. N. W. Osborne, 6, Warwick Court, W.C.1, released August 7th.

E. A. Kann, electrical and radio manufacturers' agent, 61, Lansdowne Place, Hove.—Trustee, Mr. A. C. Williams, Official Receiver, 8, Old Steine, Brighton, released September 3rd.

H. J. Gill, electrical engineer and radio dealer, 10, High Street, Keynsham, Somerset.—Trustee, Mr. H. Wheeler, Official Receiver, 26, Baldwin Street, Bristol, released September 2nd.

J. N. Hogg, electrical engineer, 104, Allerton Road, Liverpool.—Trustee, Mr. P. S. Booth, 5, Rumford Place, Liverpool, released August 18th.

W. Segal, retail wireless dealer, 190, Whitechapel Road, E.1.—Last day for receiving proofs for dividend, September 22nd. Trustee, Mr. C. Latham, 185-188, High Holborn, W.C.1.

STOCKS AND SHARES

TUESDAY EVENING.

THE general disposition of Stock Exchange markets tends to repetition week after week. The outstanding features are the strength of gilt-edged securities and the absorption of the best class ordinary shares, together with the natural sequel of a famine in debenture stocks and marked scarcity in preferences. No little surprise during the past few business days was created by a violent rise in Brazilian Tractions.

Debenture Stocks

Next month, the Canadian Government is repaying about £35 millions sterling to holders of certain of its stocks, and the knowledge that this money falls due so soon is leading to a search for alternative investments. It may be useful, therefore, to mention that there is available in the Stock Exchange market £10,000 British Columbia Electric Railway 4½ per cent. perpetual debenture stock, offered at 107, interest payable at the end of March and September. The stock is perpetual, and the annual interest requires £118,500 for its service. In the last published accounts, there was £501,400 available for meeting it. The yield at the present price is £3 19s. 6d. The British Columbia Electric Railway guarantees principal and interest of the Vancouver Power 4½ per cent. perpetual guaranteed debenture stock, and of this there is £2,500 on offer at 106, giving a return of 4 per cent.

Redeemable Investments

London Power 3½ per cent. debenture stock can be bought to a moderate extent at 100, interest January and July; the stock is redeemable in 1972 at 100, but the company has the option to pay it off at par at any time after 1952. Risk of depreciation is negligible so long as the Government maintains its present tight control of the money market and money conditions. About £5,000 Edmundsons 4 per cent. debenture can be obtained at 105 with interest due at the end of June and December. To meet the £203,000 required for the annual service of the issue there was in the last accounts £896,000 available. The flat yield is £3 16s. per cent., but the company can repay the issue at any time after 1950 at 100, and assuming, for the sake of argument, that the stock is redeemed at 100 in 1950, the yield, allowing for redemption, would be £3 7s. per cent.

L.P.T.B. Rating

Twenty thousand pounds is not going to be the limit to the costs in the dispute between the London Passenger Transport Board and the Railway Assessment Authority over the rating valuation which the Transport Board has been called upon to face. The Assessment Authority's valuation figure is £1,594,000. The London County Council argued that the proper valuation should be over two million pounds. The Board put it at something under £400,000, and the case started two months ago. The point in dispute was whether or not the Assessment Authority had accurately determined the average receipts of the Transport Board over a fixed period. Pending a decision in the matter Transport "C" stock has lagged behind the other Home Railway stocks and at 42 the price shows a fall of 1½ on the week. Southern Railway stocks hold their previous ground. British Electric Traction deferred keeps steady at 885.

Price Fluctuations

The list of Home electricity supply shares contains a small number of improvements ranging from 6d. to 1s. 3d. In the Overseas group, a further rise of 3 points has lifted Tokyo Electric sixes to 32½. Madras Electric shares have come back to 21s. 3d. Atlas Electric Trust improved to 3s. on the more favourable financial news received from the South American Continent. Dollar stocks are in request and Shawinigan Power have risen $1½ to $16, Montreal Power $2 to $26½.

Amongst equipment and manufacturing, British Insulated ordinary at 90s. have put on half-a-crown; a similar gain was secured by Consolidated Signals at 75s. In sympathy with the last-named, Westinghouse Brake gained 1/6 to 47s. 6d. Telephone Constructions and Telephone Manufacturing are a little harder. Electrical and Musical Industries at 12s. 3d. rose 6d. on persistent talk about the likelihood of a dividend being paid this year. Aron shares are better at a guinea. Thorn Electrical Industries 5s. ordinary shares are quoted at 10s. ex the dividend of 1s. The company's 6 per cent. preference are quoted at about 17s. 6d.

Telegraphs and Telephones

For many weeks past the price of Great Northern Telegraphs has been standing in the neighbourhood of 12½. The nominal quotation is now £1 up at 13½, but actually the price is more like 14, and the shares are, at the moment, more easily sold than bought. Great Northern Telegraph shares, are largely held in Denmark. Gossip has it that the Danish Royal family has a substantial holding. Until lately, dealings in the shares could only take place under restriction, but the ban hitherto imposed has lately been lifted and there is now something of a market in the shares. Other telephone communication issues are rather better. There are buyers about for Cable and Wireless preference; the market is none too well supplied with stock.

Oriental Telephones at 3½ are 5s. higher. The estimated break-up value is put, perhaps conservatively, at £4 per share. When the sale of the three Indian undertakings to the

(*Concluded on page* 249)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 9	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	51/3	..	4 17 5
British Power and Light	7	6	25/-	..	4 16 0
City of London	7½	7	25/9	..	5 8 9
Clyde Valley	8	8	37/6	..	4 5 4
County of London	10½	8	35/-	..	4 11 5
Edmundson's:					
7% Pref.	7	7	32/6	+½	4 6 2
Ord.	6	6	27/-	..	4 9 0
Elec. Dis. Yorkshire	9	9	38/9	..	4 3 0
Elec. Fin. and Securities	12½	12½	42/6	..	5 17 8
Elec. Supply Corporation	11½	10	41/3	..	4 17 0
Isle of Thanet	2	Nil	8/6	..	—
Lancs Light and Power	7½	7½	33/3	+9d.	4 10 4
Llanelly Elec.	5½	5½	21/-	..	5 4 9
Lond. Assoc. Electric	5½	4½	19/6	+9d.	4 12 4
London Electric	7	7	23/9	..	5 10 0
London Power Deb. Red.	5	5	104	..	4 16 2
Metropolitan	10	8	35/-	+6d.	4 11 5
Midland Counties	8	8	37/6	+6d.	4 5 4
Mid. Elec. Power	9	9	37/6	..	4 16 0
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary	7	7	29/6	..	4 15 0
7% Pref.	7	7	33/3	..	4 4 2
Northampton	10	10	43/9	..	4 11 5
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	10	7	35/-	..	4 0 0
6% Pref.	6	6	29/6	..	4 1 4
Richmond Elec.	6	6	22/6	..	5 6 8
Scottish Power	8	8	38/3	+9d.	4 3 4
Southern Areas	5	5	17/6	..	5 14 3
South London	7	7	23/6	..	5 19 2
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	18/3	..	4 18 8
Yorkshire Elec.	8	8	38/3	..	4 4 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	3/-	+3d.	—
Calcutta Elec.	8*	7*	37/-	..	3 15 9
Cawnpore Elec.	10	10	28/3	..	7 1 7
East African Power	7	7	25/9	..	5 8 9
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/-)	7½	7½	12/6	..	6 0 0
Madras Elec.	6*	4*	21/3	−⅛	3 15 1
Montreal Power	1½	1½	26½	+2	6 2 5
Palestine Elec. "A"	Nil	Nil	18/3	..	—
Perak Hydro-elec.	2½	6	17/6	..	6 17 2
Shawinigan Power	83cts.	90cts.	16	+1½	—
Tokyo Elec. 6%	6	6	32½	+3	18 9 4
Victoria Falls Power	15	15	80/-	..	3 15 0
Whitehall Inv. Pref.	7½	7½	13/9	..	10 18 2

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 9	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110	..	4 11 1
1955–75	5	5	113xd	..	4 8 6
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	100½	..	3 9 8
1974–94	3½	3½	93	−1	3 10 0
London Elec. Trans. Ltd.	2½	2½	94	..	2 13 2
London & Home Counties 1955–75	4½	4½	106½	..	4 4 6
Lond. Pass. Trans.:					
A	4½	4½	113½	..	3 19 4
B	5	5	111½	+1	4 9 8
C	1½	3	42	−1½	7 2 10
West Midlands J.E.A. 1948–68	5	5	108½	..	4 12 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	107½	..	5 11 9
Def.	1½	1½	24½	..	6 2 5
Anglo-Portuguese	8	8	15/-	..	10 13 4
Cable & Wireless:					
5½% Pref.	4½	5½	103	+1	5 6 10
Ord.	4	4	62	..	6 9 0
Canadian Marconi $1	Nil	4cts.	6/3	..	3 5 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	28/9	..	—
Pref.	6	6	27/6	..	4 7 3
Great Northern Tel. (£10)	20	20	13½	+1	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	27/6	..	5 9 1
Oriental Tel. Ord.	11½*	16	3½	+½	4 11 6
Telephone Props.	6	6	11/3	..	10 13 4
Tele. Rentals (5/-)	10	10	8/-	..	6 5 0
Traction and Transport					
Anglo. Arg. Trams:					
First Pref. (£5)	Nil	Nil	2/-	..	—
4% Inc.	Nil	Nil	4½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	885	..	5 1 8
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8*	8	41/3	..	3 17 8
Brazil Traction	$1	50c.	11	+2½	—
Calcutta Trams	8	5½	23/9	..	4 12 7
Cape Elec. Trams	5	5	17/-	..	5 17 4
Lancs Transport	10	10	42/6	..	4 14 1
Mexican Light:					
1st Bonds	5	5	45	..	—
Rio 5% Bonds	5	5	85	..	5 17 8
Southern Rly.:					
5% Prefd.	5	5	63½	..	7 17 6
5% Pref.	5	5	96½	..	5 3 7
T. Tilling	10	10	46/3	..	4 6 7
Tilling & B.A.	8*	7*	52/6	..	2 13 4
West Riding	10	10	39/-	..	5 2 7

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 9	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	Nil	7½	21/–	+6d.	7 2 10
Assoc. Elec.:					
Ord.	10	10	42/6	..	4 14 3
Pref.	8	8	36/3	..	4 8 5
Automatic Tel. & El.	12½	12½	46/3	..	5 8 3
Babcock & Wilcox	11	11	44/6	..	4 18 10
British Aluminium.	12½	10	47/6	..	4 4 1
British Insul. Ord. .	20	20	90/–	+½	4 9 0
British Thermostat (5/–)	18½	18½	12/6	..	7 8 0
British Vac. Cleaner (5/–)	40	12½	8/3	..	7 11 6
Brush Ord. ..	Nil	Nil	4/–	..	—
Callender's ..	15	15	68/9	..	4 7 0
Chloride Elec. Storage	15	15	65/–	..	4 12 4
Consolidated Signal	17	17	75/–	+½	4 10 10
Crabtree (10/–) ..	17½	17½	27/6	..	6 7 4
Crompton Parkinson Ord. (5/–) ..	30	20	19/6	..	5 2 8
E. K. Cole (5/–) ..	10	Nil	6/9	..	—
E.M.I. (10/–) ..	5	Nil	12/3	+6d.	—
Electric Construction	10½	10	32/6	..	6 3 0
Enfield Cable Ord.	16½	12½	51/3	–⅛	4 17 6
Elecl. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	35/–	..	5 14 2
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	25*	22*	37/6	..	2 18 8
Ever Ready (5/–) ..	40	40	28/3	..	7 1 7
Falk Stadelmann ..	7	7½	17/6	..	8 11 6
Ferranti Pref. ..	7	7	26/3	..	5 6 10
G.E.C.:					
Pref.	6½	6½	32/6	..	4 0 0
Ord.	20	17½	80/–	..	4 7 6
Greenwood & Batley	15	13	22/6	..	11 11 2
Hall Telephone(10/–)	15	10	13/9	..	7 5 6
Henley's (5/–) ..	20	20	21/3	..	4 14 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	44/6	–6d.	6 14 10
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	105/–	..	5 14 3
J. Lucas	15	15	61/3	+⅛	4 18 0
Johnson & Phillips	15	15	51/3	..	5 18 10
Lancashire Dynamo	20	20	57/6	..	6 19 0
Laurence, Scott (5/–)	15	15	10/9	..	6 19 6
London Elec. Wire	7½	7½	22/6	..	6 13 4
Mather & Platt ..	13½	10	43/9	..	4 12 6
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	90/–	..	4 9 0
Pye Deferred (5/–)	25	25	13/9	..	9 1 10
Revo (10/–) ..	5	20	23/9	..	8 8 5
Reyrolle	12½	12½	55/–	..	4 10 3
Siemens Ord. ..	7½	7½	23/9	–⅛	6 6 4
Strand Elec. (5/–)..	4	2	3/–	..	3 6 8
S. Smith (1/–) ..	37½	50	7/–	–6d.	7 2 10
Switchgear & Cowans (5/–) ..	10	15	8/9	..	8 11 6
Tel. Condenser (10/–)	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	+⅛	4 17 0
Telephone Mfg. (5/–)	9	9	8/–	+3d.	5 12 6
Tube Investments..	23¾	23¾	95/–	..	5 0 0
Vactric (5/–) ..	4	Nil	3/–	..	—
Vickers (10/–) ..	10	10	16/6	+3d.	6 1 3
Ward & Goldstone (5/–)	20	20	16/6	..	5 19 9
Westinghouse Brake	17½	10	47/6	..	4 4 4
Walsall Conduits (4/–)	55	55	31/3	..	7 0 9
West, Allen (5/–) ..	7½	7½	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 247)

Government of India is completed, it is thought that the company will make a partial return of capital. The whole position is apparently to be reviewed in 1943.

For "Recovery"

Amongst what are called the "recovery" stocks for which inquiry is seeking, Isle of Thanet Electric ordinary and preference attract attention. The company has paid no dividends on either its ordinary or its preference shares since March, 1940. The preference are entitled to a cumulative 6 per cent. and, after the ordinary have received 6 per cent. for any one year, the two classes of shares rank equally for any further distribution. For the nine years 1930 to 1938 inclusive, the ordinary shares received annual 4 per cent. dividends. For 1939, 2 per cent. was paid and nothing has been distributed since then. The company's area covers Margate, Broadstairs, Westgate and Birchington; vulnerable spots, of course, and sufferers from last year's raids. The preference shares stand at 15s. 3d., the ordinary at 8s. 6d. Unless some unexpected turn occurs in the company's fortunes, dividends on the ordinary are hardly likely to be resumed during the war. Afterwards, however, the company should find plenty of profitable business.

Brazilian Boomlet

A dramatic rise in Brazilian Traction shares lifted the price from 8¾ to 11, most of the advance taking place in the course of a couple of days. The buying which produced the rise is founded on unexpectedly good news in connection with certain San Paulo loans. Additional exchange has obviously been obtained in Brazil which enables Brazilian Government sinking funds to be substantially increased, and the San Paulo announcement served to give a fillip to practically all the stocks and shares connected with the Republic.

The news stimulated a mild bout of speculation in Brazilian Traction shares, because the company has been making good profits for some time past without being able to distribute these owing to the impossibility of making remittances to this country. The last dividend paid on the common shares was 50 cents three-and-a-half years ago. The shares are of no par value.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

29558. "Mosaic screens particularly for use in television apparatus." Standard Telephones & Cables, Ltd. November 7th, 1938. (538753.)

31274. "Copper base alloys, and conductors for electricity formed from copper base alloys." A. H. Stevens (American Brass Co.). December 1st, 1939. (538644.)

1940

736. "Combinations of a h.p., m.v. lamp with means for cooling it." General Electric Co., Ltd., C. R. Dunham and V. J. Francis. January 12th, 1940. (538793.)

770. "Electric plug-and-socket connectors." H. Burrows. January 13th, 1940. (538757.)

2258. "Hard alloys." British Thomson-Houston Co., Ltd. February 7th, 1939. (538721.)

2399. "Electrical metering apparatus." B. A. Vuille and Watford Electric & Manufacturing Co., Ltd. (Augier-Queyras, in part). February 7th, 1940. (538649.)

2528. "Coin-testing devices for automatic coin actuated machines." Westinghouse Brake & Signal Co., Ltd., and W. E. Burnett. February 9th, 1940. (538824.)

2535. "Modulating system for carrier frequency signalling and the like." Standard Telephones & Cables, Ltd. April 5th, 1939. (538795.)

2536. "Electron-discharge devices incorporating electron multipliers." Standard Telephones & Cables, Ltd. February 11th, 1939. (538760.)

2564. "Control indicating or recording systems incorporating electrically controlled servo-motors." N. R. Davis and Sun-Vic Controls, Ltd. February 9th, 1940. (538761.)

2658. "Production of curved surfaces." English Electric Co., Ltd., and E. H. H. Hassler. February 12th, 1940. (Cognate application 1965/41.) (538765.)

2670. "Cathode-ray tubes." Philco Radio & Television Corporation. February 25th, 1939. (538684.)

2742. "Impulse-driven electric motors." Standard Telephones & Cables, Ltd. and E. R. Myatt. February 13th, 1940. (538723.)

2744. "Devices for the transmission and display of information." Standard Telephones & Cables, Ltd., and W. H. M. Hellier. February 13th, 1940. (538724.)

2745. "Selector switches such as are used in automatic telephone systems." Standard Telephones & Cables, Ltd., and E. Mills. February 13th, 1940. (538725.)

2798. "Electric or other lamps." G. H. Collins and J. A. Johnson. February 14th, 1940. (538799.)

2875. "Electric couplings." C. Metcalfe and R. E. Spencer. February 15th, 1940. (538801.)

3622. "Electric signal transmission systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). February 27th, 1940. (538807.)

3695. "Recording and reproduction of electrical impulses." Radio Corporation of America. March 31st, 1939. (538771.)

4372. "Water heaters." General Electric Co., Ltd., R. Harvey and A. E. Sarson. March 8th, 1940. (538810.)

4453. "Modulation of high-frequency currents." Marconi's Wireless Telegraph Co. March 10th, 1939. (538775.)

4695. "Means for maintaining equality of speed and for the remote control of prime mover power units." N. W. Wright. March 13th, 1940. (538812.)

4768. "Electric flashlamps." British Thomson-Houston Co., Ltd. March 16th, 1939. (538669.)

4805. "Controllers for synchronous electric motors." Igranic Electric Co., Ltd. March 27th, 1939. (538670.)

4943. "Steam boilers and furnaces therefor." A. Walker. March 16th, 1940. (538776.)

5041. "Phase modulation of high-frequency currents." Marconi's Wireless Telegraph Co., Ltd. March 18th, 1939. (538814.)

5178. "Compressed-air circuit-breaker having a resistance bridging the contacts." Allmänna Svenska Elektriska Aktiebolaget. March 30th, 1939. (538672.)

5802. "Electric lighting installations." G. F. J. Dandridge. April 1st, 1940. (538673.)

5829. "Electrical oscillators comprising thermionic valves." General Electric Co., Ltd., and R. S. Rivlin. April 1st, 1940. (538674.)

5968. "Tumbler switches for the control of alternating current." J. H. Tucker & Co., Ltd., and F. C. Fuke. April 3rd, 1940. (538780.)

7003. "Flashlamps." British Thomson-Houston Co., Ltd. April 21st, 1939. (538676.)

7234. "Timing controllers for electric circuits." Igranic Electric Co., Ltd. May 16th, 1939. (538695.)

7421. "Calculating device for use in photographic printing operations." Sangamo Weston, Ltd. April 24th, 1939. (538696.)

8772. "Electric switches with sliding contacts." R. Goldenberg. May 16th, 1940. (538704.)

8948. "Drums suitable for the coiling thereon of electric cables, wires and similar articles." W. T. Henley's Telegraph Works Co., Ltd., and F. T. Griffiths. May 20th, 1940. (538705.)

8953. "X-ray apparatus." British Thomson-Houston Co., Ltd. May 20th, 1939. (538706.)

9038. "Ion exchange processes for the treatment of water." Permutit Co., Ltd. (Permutit Akt.-Ges.) May 21st, 1940. (538818.)

9129. "Electrical remote control devices." Igranic Electric Co., Ltd. July 20th, 1939. (538732.)

9274. "Shaft packings." British Thomson-Houston Co., Ltd. May 26th, 1939. (538734.)

10420. "Electric motor control systems." British Thomson-Houston Co., Ltd. June 17th, 1939. (538742.)

13346. "Electric valve control circuits for electric motors." British Thomson-Houston Co., Ltd. August 25th, 1939. (538748.)

14017. "Method of insulating and covering electrical conductors." Okonite Co. September 13th 1939. (538749.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Dewsbury.—September 23rd. Corporation. Reactor and voltage regulator. (September 5th.)

Fife.—September 16th. County Council. Various works, including electric lighting and heating, at temporary school accommodation at Rosyth. G. Sandilands, county master of works, County Offices, Kirkcaldy (£1 1s.).

Kesteven.—Public Assistance Committee.—Supply of electric lamps for the six months ended March 31st, 1942, to institutions at Grantham, Sleaford and Stamford. Public Assistance Officer, County Offices, Sleaford, Lincs.

Malvern.—September 19th. Urban District Council. Electrical centrifugal pumping set to deliver 10,000 gallons of water per hour against a head of 420 ft. C. C. Judson, surveyor and water engineer, Council House, Malvern.

Morley (Yorks).—September 30th. Electricity Department. Change-over of two installations from single- to three-phase. Borough electrical engineer, Electricity Office, Morley, Yorks.

New Zealand.—AUCKLAND HARBOUR BOARD.—September 30th. Ten 5-ton electric cranes.

Salford.—September 17th. City Council. Three-phase oil-immersed power transformers. (August 29th.)

South Africa.—SALISBURY (S. RHODESIA).—September 29th. Two 2,500-kW turbo-alternators and exciters with complete condensing and auxiliary plant. (August 15th.)

October 13th. City Council. Stoker-fired water-tube boilers and other power station plant. (August 29th.)

October 27th. Switchgear, transformers and reactors, together with auxiliary apparatus. (August 29th.)

DURBAN.—October 3rd. City Council. Overhead line material for trolley-bus operation (contract S.1972). 3/0 trolley wire (contract S.1973). Overhead line material for tramway operation (contract S.1975).

October 17th. Telephone cable (contract P.261). 72 transformers (contract E.2032).

POST OFFICE.—December 4th. Equipment for radio-telephone link between Maseru and Mokhotlong.

Sunderland.—September 15th. Education Authority. Wiring for electric lighting installations in a number of school air-raid shelters. (August 29th.)

Orders Placed

Glasgow.—Transport Committee. Accepted. Trolley-switches for Mains Department.—B.I. Cables.

Ilford.—Electricity Committee. Accepted. Cooling tower repairs.—Premier Cooler & Engineering Co., Ltd. (£948.)

Singapore.—MUNICIPALITY. Recommended. Three 100,000 lb. per hr. boilers (£232,500).—Babcock & Wilcox, Ltd. One 20,000-kW turbo-alternator (£95,964).—Metropolitan-Vickers Electrical Export Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Restaurant (£600); borough engineer.

Reconstruction of Moreton Street cleansing depot; borough engineer.

Barnsley.—Canteen, Tankersley, for Silkstone Clothing Co., Ltd.; H. Ibbotson, secretary.

Bellingham (Northumberland).—Hostel at Wark for the Ministry of Agriculture.

Bewdley.—Additions to fire station, and shelters, for Town Council; borough surveyor.

Bingley.—Conversion of Lyndhurst Hall, Bank Drive, for use as day nursery; U.D.C. surveyor, Town Hall, Bingley, Yorks.

Blackpool.—Bakehouse extensions, 22, Anchorsholme Lane; S. M. Brockenshaw.

Boldon (Co. Durham).—British Restaurant at Marsden; U.D.C. surveyor.

Bolton.—Works additions, Manchester Road; Alan's (Bolton), Ltd.

Bootle.—Feeding centre, Victoria House (£956); borough engineer.

Bournemouth.—Four cleansing stations(£6,000); G. E. & W. Lambert, F. Hoare & Sons, G. Shears & Sons, and V. L. Young.

Bridlington.—Additions to fire station, and adapting premises for further stations, for Town Council; G. Melvin, town clerk, Town Hall.

Bury.—British Restaurant at Elton for Bury Corporation; J. Chadwick, borough surveyor, Municipal Offices, Bank Street, Bury.

Caterham.—Restaurants, Croydon Road (£915); U.D.C. surveyor.

Cheltenham.—Alterations, Sandford Road and College Road; Cheltenham College Council.

Cheshire.—Remand home; County Council and Chester, Birkenhead and Wallasey Corporations.

Consett.—British Restaurants at Leadgate and Blackhill; T. P. Leath, surveyor.

Croydon.—Establishment of restaurant at 59-63, Lower Addiscombe Road (equipment, etc., to cost £2,757), for Feeding Committee; E. Taberner, town clerk, Town Hall.

Dundee.—Additional accommodation at Mental Hospital; city engineer, Town Hall, City Chambers.

Eccles.—Reconstruction of stores, Station Road, Swinton; Eccles and District Co-operative Society, Ltd., Peal Street.

Edinburgh.—A.R.P. shelters at child welfare centres; city architect.

Eire.—DUBLIN.—Building for employment exchange, Hoey's Court, for Commissioners of Public Works; G. P. Fagan, secretary, Office of Public Works, Dublin.

CASHEL.—Water supply scheme for U.D.C.; N. O'Dwyer, consulting engineer, 6, Burlington Road, Dublin.

GALWAY.—New maternity hospital, for County of Galway Board of Health and Public Assistance; T. J. Cullen, architect, 25, Suffolk Street, Dublin.

OFFALY.—Complete sewerage system, for County Board of Health and P.A.; N. O'Dwyer, consulting engineer, 6, Burlington Road, Dublin.

SLIGO.—Houses (36), Albert Lane, for Town Council; borough surveyor.

SOUTH CORK.—Proposed erection of cottages (£300,000), for Board of Health; J. Hurley, secretary, Boardroom, Douglas Road, Cork.

Epsom and Ewell.—Establishment of four British Restaurants; Norman Auty, borough engineer, Town Hall, The Parade, Epsom.

Eston.—British Restaurants at Eston, South Bank and Normanby; U.D.C. surveyor.

Fifeshire.—A.R.P. shelters for county council; master of works, County Offices, Kirkcaldy.

Gateshead-on-Tyne.—Another communal feeding centre; F. R. Patterson, borough engineer, Town Hall, Gateshead.

Glasgow.—Houses, Penilee estate; housing director.

Repairs, Kelvingrove art gallery (£5,500); city engineer.

Hay.—Pumping station, chlorinating house, etc., for U.D.C.; A. H. S. Waters, consulting engineer, 25, Temple Row, Birmingham, 2.

Ilford.—Cold store, Beehive Lane; J. Sainsbury, Ltd.

Extensions, Clayhall depot (£3,909); W. Bundey, Prittlewell, Essex.

Kettering.—School canteens for 450 children; F. Smith, acting borough surveyor, Gold Street, Kettering.

Knutsford.—Public cleansing station for Cheshire C.C.; W. A. Batty, County A.R.P. architect, 13, Sandy Lane, Chester.

Leigh.—Reconstruction of premises; secretary, Busy Bee, Ltd., 65, Bradshawgate, Leigh, Lancs.

Manchester.—Shelters, Monsall fever hospital (£4,000); city engineer.

Morley.—Office and egg store; Poultry Producers (W.R.), Ltd., Hebden Bridge.

Newcastle-on-Tyne.—Conversion of the assembly rooms into restaurant (£3,800); J. and W. Lowry, builders, Corporation Street, Newcastle-on-Tyne.

Northampton.—Factory extension; E. Martin (Engineers), Ltd.

Northern Ireland.—LARNE.—Extensions, Glenarm; Gallaher, Ltd.

Nuneaton.—British Restaurant, Queen's Road School; R. C. Moon, borough surveyor, Council House.

Oakengates.—Proposed further houses, for U.D.C.; surveyor, Ellerslie, Stafford Road.

Salisbury.—Street surface shelters (£3,200), for Town Council; A. Smart, town clerk, Council House, Bourne Hill, Salisbury.

Sheffield.—Licensed premises, Parson Cross estate; John Smith's Tadcaster Brewery Co., High Street, Tadcaster.

Wholesale markets for Markets Committee; W. G. Davies, city architect, Town Hall, Sheffield.

Buildings, Greenland Road estate; Wm. Gunstone & Sons, Ltd.

Stalybridge.—School canteen (£1,741); borough engineer.

Sunderland.—Canteen for J. A. Jobling & Co., Ltd.

Storage shed, Darcy Street, for Dawson & Usher.

Urmston.—Alterations, etc., Trafford Park Road; Brooke Bond & Co., Ltd.

Woodford. — Establishment of British Restaurant at Memorial Hall (£1,800), for Wanstead and Woodford Town Council; R. T. Binks, Municipal Offices, Woodford, E.18.

Yorkshire.—New report centres at Flaxton and Eston for the C.C. (£1,000); North Riding county architect, County Hall, Northallerton.

Plant Extensions at Singapore

A STANDING committee of Singapore Municipality has recommended the acceptance of tenders amounting to £328,464 for additional plant to be installed at the St. James' power station. The tenders are those of Babcock & Wilcox, Ltd. (£232,500), for three 100,000 lb. per hr. boilers, and of the Metropolitan-Vickers Electrical Export Co., Ltd. (£95,964), for a 20,000-kW turbo-alternator. The extension follows upon a report in 1939 by the municipal electrical engineer, Mr. C. C. Payne, in which he advised that in view of the continued expansion of the department's activities and the increase in the peak load, consideration should be given to the installation of further generating plant in order to keep ahead of the estimated load growth.

Glass Tops for Hot Cabinets

AS a result of tests carried out by Pilkington Brothers, Ltd., at the request of the Board of Trade, toughened glass may now be used in place of steel for the tops of hot cabinets of the type widely used in works canteens and restaurants. The glass can be supplied to withstand extreme changes of temperature, but the new use is confined to hot cabinets normally operating at temperatures of 120 to 150 deg. F.

This new use of glass, it is stated, not only releases valuable war material, but adds to the efficiency of the hot cabinets. Furthermore, light is admitted into the cabinet, thus enabling the cook to watch the food and also making it easier to clean the cabinet thoroughly. The toughened glass takes longer to warm up than steel, but has a lower heat conductivity which lowers heating costs, particularly where lengths of hot cabinets or batteries of steamers are used. The cost, it is stated, compares favourably with that of the material replaced.